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THE MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● ERIC THORPMAN is one of the foremost Swedish exponents of miniature car racing. He is seen here with two of his record-breaking models, both of which follow closely the popular American design.

Mr. Thorpman is a flight engineer with one of the Swedish airlines and a member of the International Model Race Car Association; he is, therefore, able frequently to compete in events in the U.S.A. British model car enthusiasts will remember him as leader of the Swedish team which visisted Britain last year.

Club Announcements

● IT IS inevitable that when, at annual general meetings or the formation of new clubs, fresh officers take on secretaryships or are elected as Press Relations officers, they may not be fully aware of the procedure to be observed when preparing notices and announcements for publication. We usually become aware of this at about this time of year, and we would, therefore, draw the attention of any new secretaries or P.R.O's to the few simple requirements which should be observed if misunderstandings are to be avoided. All club announcements or other notices intended for publication in THE MODEL ENGINEER columns under the "Club Announcements" heading, should be on separate sheets, and those which contain the dates of future meetings should reach us not later than 14 days before the date of publication. They should *always* include the name and full postal address of the hon. secretary.

Since demands upon our space are very severe, we regret that we cannot accept lengthy reports of past events; only the briefest references should be made.

A Good Idea

● WE WERE interested to learn that a model engineering society has been formed at the Queen's School, Wisbech, recently, to run in conjunction with the Wisbech Technical Institute. The intention is to cater for all kinds of engineering, including steam, petrol and diesel. At the meeting at which this decision was made, 21 people, including a young lady, attended; they all joined the club.

It was also decided that members could make what they pleased. Any model aeroplanes built could be flown in the school playground, and an insurance scheme will cover any damage.

The club is to meet every Wednesday evening and it is open to any females who are sufficiently interested. The latter idea is one which we think might well be considered by most other model engineering clubs; so far as we know, there are not many in the country numbering ladies in their membership, but models built by ladies usually display that delicate touch which is more often lacking in the work of mere males! With a little persuasion, ladies might be more often prevailed upon to join a club.

Proposed Transport Museum

● IT MAY not be generally known that in November, 1947, the then newly-formed British Transport Commission invited the chairmen of the main-line railway companies and the London Passenger Transport Board to give their views on the best means of dealing with the collections of relics and records in their possession which would pass to the commission on January 1st, 1948, and which the companies and the commission were anxious should be carefully preserved. This eventually led to the formation of a committee, under the chairmanship of the deputy secretary of the commission, on which representatives of all executives were included.

The committee has just published a very comprehensive report giving its findings and recommendations on the subject of providing a Transport Museum, covering all kinds of public land transport. The report, which is very well produced, makes very good reading and we devoutly hope that its recommendations will be carried out, in due course.

The list of vehicles and other full-size relics, at present owned by the commission and preserved in various parts of the country, comprises some sixteen locomotives, four carriages, two tramcars, seven omnibuses and five stationary engines. The problems concerned with finding permanent housing for these treasures and making arrangements for their proper care, as well as, at the same time, allowing for additional relics in the future, are fully considered in the report.

Such items as books, papers, pictures and other small relics also receive their full share of attention and some very constructive suggestions are made concerning their preservation.

The question of providing competent staff for the museum is dealt with in detail; in fact, we can think of nothing which has been overlooked. The care and thought that have gone into the preparation of this report show that the importance of the matter is adequately realised, and the fact that present circumstances mitigate against any immediate steps being taken to put the recommendations into effect is greatly to be regretted. The report is obtainable from the British Transport Commission, 55, Broadway, London, S.W.1, price 1s. 6d.

Two New Societies

● FROM THE hon. secretary, Mr. L. Burkinshaw, 396c, Hasland Road, Chesterfield, we learn that a society to be known as the Scarsdale Society of Modellers (Chesterfield) has been formed. Although, at the moment, there are only twelve members, some idea of their enthusiasm may be gauged from the fact that models being built include: a 3½-in. gauge *Tich*, a 5-in. gauge *Maid of Kent*, a 3½-in. gauge *Marina*, a 3½-in. gauge *Juliet*, a 7¼-in. gauge "8F," a 2-in. scale traction engine and a 3½-in. and 5-in. gauge portable track with cars. This is quite a respectable programme to have in hand, all at one time, and we hope to hear in due course that it has been duly completed. But, in addition, one of the members is the proud possessor of a full-size Burrell traction engine in perfect working order, and with this the members hope to spend some interesting hours later on.

The immediate programme includes lectures by members and visits to local industrial concerns, and if there are any modellers in the Chesterfield district who would be interested in joining the society, they are invited to get into touch with Mr. Burkinshaw at the address given.

From Mr. James Kennedy comes news of the formation of the Inverness and District Society of Model Engineers, the first meeting of which was held on January 15th. Twenty-five members attended and eight other names were submitted by people who were unable to attend. This was quite a promising beginning, and we hope to hear, in due course, that the number has increased.

The chairman is Mr. E. J. Vaughan, a former secretary of the Derby S.M.E.E., now resident in Inverness; his past experience should be invaluable to the new society. All model engineering interests are to be catered for, and we believe that there are already in the town, or district, several readers who would support a society.

Mr. Kennedy, who is hon. secretary and treasurer, will be pleased to give all information; his address is: 30, Midmills Road, Inverness.

Proposed Exhibition in Cleckheaton

● WE HAVE been informed that the Spenborough Society of Model and Experimental Engineers intends to hold an exhibition in the Town Hall, Cleckheaton, next May. In order to ensure that a really first-class show will be possible, the society's committee would be grateful for help from other societies, the secretaries of which are cordially invited to get into touch with Spenborough's Exhibition Secretary, Mr. H. L. Blamires, 8, Manor Street, Hartshead Moor, Cleckheaton, Yorks.

An Injector Query

● WRITING FROM British Columbia, Mr. W. H. Porter states that he was greatly interested in "L.B.S.C.'s" article on injectors, and adds: "About sixty years ago, I was waiting at a small town station in the south of Ireland for a train, when I saw an engine, a 2-6-0 tank named *St. Patrick*. The injectors were mounted on top of the tanks, in a horizontal position; they were ordinary Gifford injectors and seem to have had to lift the feed about 4 ft. Perhaps some of your readers could explain this. I think the engine was built by the Atlas Works, Glasgow, for the Londonderry & Binerana Railway and sold down south."

We have not been able to trace any particulars of the engine described, but it is possible that some reader may be able to give some information about it. Obscurities of this kind are always interesting.

Apologium

● IN OUR recent note referring to a letter we had received from Mr. H. E. Clow, of Hawkes Bay, New Zealand, we stated, by a slip of the pen, that he used to be a member of the Southport Society of Model Engineers. He was, in fact, one of the founders of the Stockport Society, the members of which keep in touch with him. We are sorry for the mistake we made.

The Story of "Flying Fanny"

by Capt. G. S. Brown

IN 1925, "L.B.S.C." wrote a series of articles in his "Live Steam" column, describing the building of a $2\frac{1}{2}$-in. gauge locomotive which he called *Simple Sally*. It was to be a simple 4-4-0 with slip eccentrics and a water tube boiler, with a coal-fired boiler as an alternative.

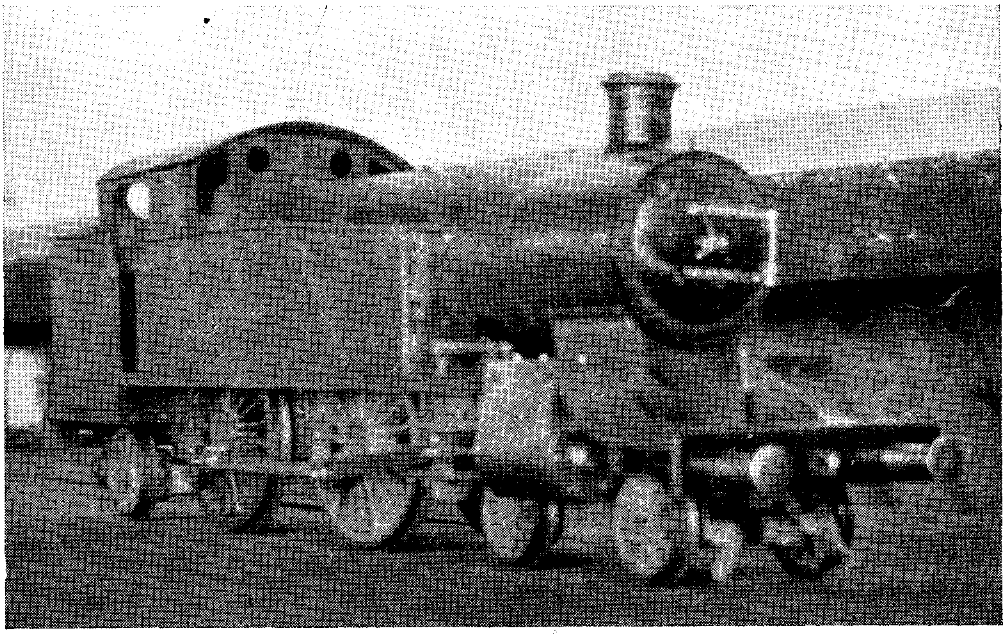


Photo by] [*G. S. Brown*

"Flying Fanny" with the original round-topped boiler shell and side tanks loosely assembled, on the bench in the hangar at Carnavon, Western Australia, 1930

"L.B.S.C." made it all sound so simple that I was encouraged to fulfil a life long ambition and build a coal fired locomotive. I had a kit of tools, but no lathe, nor had I the ability to use a lathe. However, I thought this difficulty would solve itself in the course of time.

I was then living in England, but my future movements were uncertain. This decided me to build a tank engine, as it seemed to be more compact and portable than an engine with a tender. With *Simple Sally* as the basis of design, I sketched out some drawings of a 4-4-2 tank engine with a G.W.R. outline: as *Simple Sally* had a round top firebox, the Belpaire firebox would have to be a dummy—at least that was the idea.

So wheel castings were purchased and a start was made on the frames. These were cut out and assembled with the buffer beams. Work was then suspended while I uprooted my home and sailed to Australia. In due course I found myself living in Melbourne, and, what was even better, had the use of a $3\frac{1}{2}$-in. Drummond lathe. Better still, I found the Melbourne Model Engineering Society, had just been formed, and for the first time, met fellow "Live Steamers." There was Bob Wallace, A. Austin Grey, Jim Hoyland, Meadmore and whole bunch of fellow enthusiasts. Soon after I joined, the society held a very successful exhibition which was reported in the MODEL ENGINEER in 1928. Encouraged by the sight of other members' locomotives, and particularly by Austin Grey's model $1\frac{3}{4}$-in. gauge "Ford Pacific," one of "L.B.S.C.'s" early designs, I forged ahead with *Simple Sally*. Progress was now very evident. I could push the wheeled chassis up and down on a length of track! I ordered cylinder castings from England, and while waiting for them to arrive, started on the boiler. Copper sheet was easily obtained, and I made the boiler shell and the firebox. But I could not get 22-gauge $\frac{5}{16}$-in. copper tubes for the boiler tubes, so I had to send to England for these. In the meantime, I made the smoke-box and smoke-box door and started on the side tanks and bunker. Friend Austin Grey had started on a $2\frac{1}{2}$-in. gauge Victorian Railways Pacific with *Fayette* as the basis,

and while he was making a few boiler fittings for his locomotive, he also made a safety valve and water gauge for me. The cylinder castings and the boiler tubes arrived from England, and work was started on the cylinders. The specification for *Simple Sally* included cylinders $\frac{5}{8}$ in. bore and 1 in. stroke, but the rough castings were already $\frac{11}{16}$ in. bore and so I had to finish them to $\frac{3}{4}$ in.

At this stage in the construction of *Flying Fanny*, I moved from Melbourne to Perth in Western Australia, and became a pilot on the Air Mail route between Perth and Wyndham in North West Australia. Construction on the locomotive was suspended for the time being. I flew D.H.50's with a 300 h.p. Nimbus engine along the route via Geraldton, Carnavon, Onlow, Port Hedland, Broome, Halls Creek and Ord River to Wyndham, 2,000 miles in all. The operational schedule was so arranged that one pilot flew from Perth to Carnavon and then stayed six days there, helping the engineer to overhaul the engine of the D.H.50 while another pilot flew the stand-by aeroplane on to Port Hedland, Broome and Wyndham, then back to Port Hedland where he handed over to another pilot waiting. He stayed at Port Hedland until the next aircraft came south in a week's time. There was a small Wade lathe in the hangar at Carnavon and nothing to do at Port Hedland and Carnavon except fish and shoot kangaroos.

The assembled chassis and bits of *Flying Fanny* were, therefore, bundled up in a parcel and flown to Carnavon from Perth. The cylinders had yet to have the glands and slide valves made and the pistons fitted. This work seemed to be beyond the combined capacity of my skill and the Wade lathe. The cylinders were, therefore, posted off to Bob Wallace in Melbourne, who undertook to finish them. If, after all these years, he should see this, I can tell him that he made a very fine job of them.

It was now 1929 and "L.B.S.C." was describing *Lady Kitty* in THE MODEL ENGINEER. This was a very fine $2\frac{1}{2}$-in. gauge G.W.R. 2-8-0 locomotive with Stephenson's link motion. My engine was coming along very nicely, and again, "L.B.S.C.'s" description made it sound so easy that my *Simple Sally* became a very sophisticated young woman. I decided to scrap the round topped boiler and make a Belpaire fire-box boiler. The slip eccentric idea was abandoned and Stephenson's link motion was to be fitted. Armed with my drawing instruments and the appropriate copies of THE MODEL ENGINEER, I flew from Perth up to Port Hedland, on to Wyndham and back to Port Hedland. There, on a table on the verandah of the hotel overlooking the harbour, I set out a valve gear adapted from *Lady Kitty* to my own little 4-4-2 tank engine. Then off went another letter to Bob Wallace with drawings of the eccentrics. Meanwhile, during my spells in Carnavon, work went steadily forward. I got some more copper sheet and made a new Belpaire firebox shell. This was brazed and the boiler tubes were silver soldered to the internal firebox. Then the finished cylinders arrived, together with the eccentrics. A week's stand-by at Port Hedland, and I came back to Carnavon with the bits of the valve gear all complete.

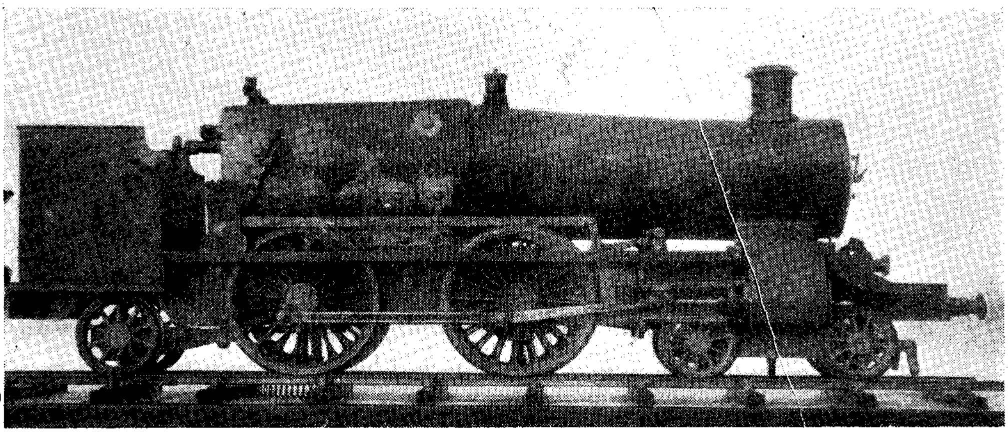


Photo by] [*G. S. Brown*

Boiler and chassis complete and ready for test at Heliopolis, Egypt, 1936

Another spell of work in the hangar at Carnavon and the chassis stood complete with cylinders and valve gear completely assembled and fitted with a nobby little reversing lever *a la Lady Kitty*. We still had a long way to go, but all was ready to "try her on the pump." This was done and she ran up and down the bench in fine style. The boiler was a long way from completion, but I could not wait for that. I made a rough boiler out of a tin, which was soldered up and fitted with a stay bolt and safety valve. The tin, placed on top of a Primus stove, made enough steam to keep her running for about two hours. At this stage economic depression made itself felt, even in remote West Australia. The price of wool fell to 9d. a pound for top fleeces and wheat fetched 1s. 8d. a bushel. As all Australians "ride on the sheep's back" and they are equally dependent on the price

of wheat, I decided to return to England.

In due course I found myself at Southsea, and work on *Flying Fanny* was resumed. A friendly garage proprietor had a gas brazing plant operated by foot bellows. This was just the job for finishing the new boiler. The boiler fitting flanges were all plugged and the boiler coupled to the tender pump and to a large pressure gauge and hydraulically tested to 120 lbs. After a few ominous creaks, the firebox and crown stays "took up," and with a little judicious caulking with molten white metal round the stay heads, the boiler was made tight. However, to be sure, I removed the pump and gave the boiler a further test by playing a blowlamp flame in the firebox of the partially filled hermetically sealed boiler and bringing the pressure up to 120 lb. again. It stood the test and was passed for service. *Flying Fanny* was well on the way, but still had a long distance to go to completion.

I then flew out to Egypt and the little locomotive was packed up and taken with me. With so many distractions in that sunny land, progress was slow. However, the great day came when steam was raised. Frantic pumping with a tyre pump, coupled to the non-return valve of the hand pump, induced enough draught to get a fire going with bits of paraffin soaked wood. Small pieces of coal shovelled into the firebox soon had a bright fire burning and the safety valve blowing off at 90 lb., and a trial run on the "test bed" was made. A few such runs soon gave me experience in firing the boiler but, as no track was available in Egypt, I had to wait until I returned to England.

In due course, I was stationed at Croydon for a short time, flying between London and Paris. While living in Egypt, I had corresponded with "L.B.S.C." about a difficulty I had had with the disc type regulator, and he had referred to my little engine in his "Shops, Shed and Road" articles in the MODEL ENGINEER for September 21st, 1933. A telephone call brought an invitation to try her out on his track, to see if "we can make her gee" as he expressed it. So I took her along, and she "geed" all right! With "L.B.S.C.'s" expert firing, steam was raised in a few minutes, and he took her round the track at what seemed to me an incredible speed. I then drove her myself, and, after some wheel slipping, got under way. The little boiler steamed furiously, and was blowing off all the time.

As I was living in the Southampton area, "L.B.S.C." suggested that I should get in touch with Mr. Van Raalte, who lived at Burlesdon and had a magnificent track. A telephone call secured an invitation to run *Flying Fanny*, and a pleasant afternoon was spent in running her and Mr. Van Raalte's $2\frac{1}{2}$-in. gauge Pacific.

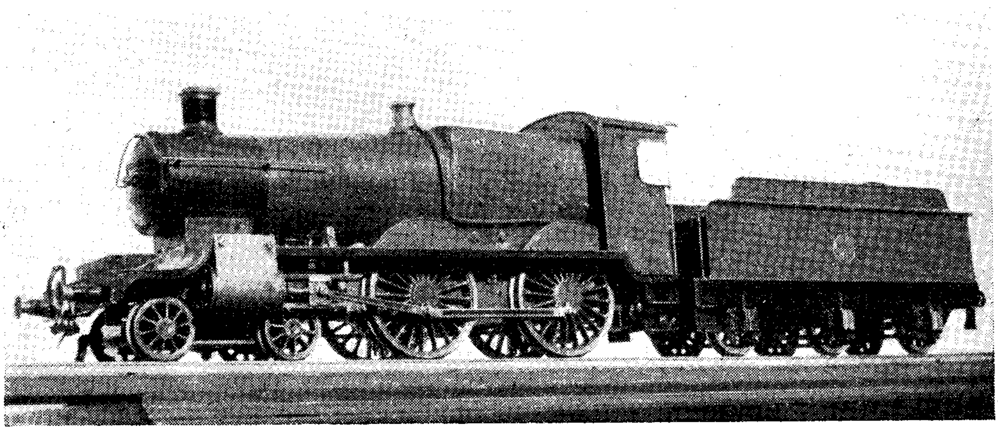


Photo by] [*G. S. Brown*

"*Flying Fanny*" *complete after conversion to a tender engine, August*, 1939

The difficulty of firing a small tank engine became apparent during these runs and this decided me to convert to a tender engine. *Purley Grange* was being described in THE MODEL ENGINEER and a tender was made to the drawings for that engine.

Much thought was given to the shape and size of the cab. Eventually I decided that a balanced appearance could only be obtained by adopting a Southern Railway type of "stepped" cab. I fear that this feature spoilt any claim that *Flying Fanny* might have had to be a G.W.R. "County" class 4-4-0, but I did not like the high cab of the old "Counties." While this conversion was under way, I took the opportunity to fit a mechanical lubricator purchased from Bonds. The hydrostatic lubricator, made and fitted in Perth, W. Australia, had never worked satisfactorily.

As the boiler was as tight as the proverbial bottle, I funked drilling the necessary holes to extend the hand rails along the boiler, and I would welcome opinion about this.

The war broke out shortly after the conversion was completed and I went overseas again. But this time, *Flying Fanny* stayed in England. The track to run her on has still to be built, and I have not had the opportunity of running the little engine in her new form.

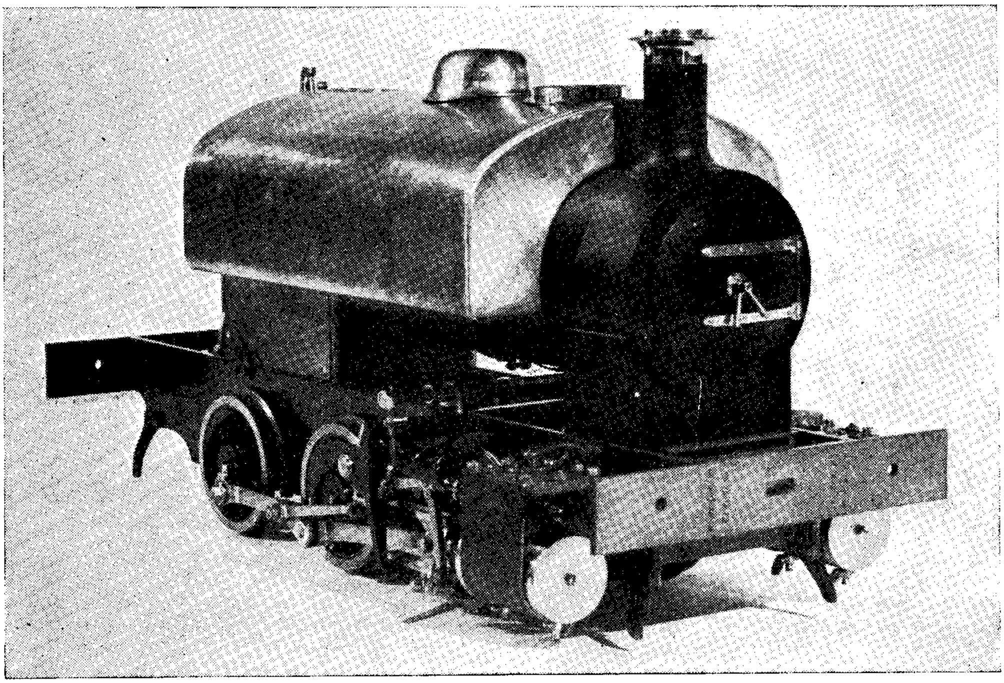
My thanks are due to "L.B.S.C." for his encouraging and entertaining articles, which I have followed since he wrote his first one in 1924.

A Successful Competition at Leeds

(Photographs by Dewhirst Newsphotos, Leeds)

THE City of Leeds S.M.E.E. held a very successful competition night for members recently, when a variety of exhibits were displayed. The judges were Mr. Miller, the president of the Brighouse Society, and Mr. Crowther, the president of the Huddersfield Society, to whom the society is duly grateful.

After careful examination of every entry, there was no hesitation in awarding the first prize to Mr. L. R. Raper, of Wakefield, for his unfinished $3\frac{1}{2}$-in. gauge contractor's saddle-tank locomotive. This is an outstanding piece of work, as may be gathered from the photograph, which, however, does not do justice to the remarkably neat and careful workmanship. Everything has just the right proportions and a number of unusual features are incorporated. Air receivers are fitted to both suction and delivery sides of the axle pump; to maintain correct proportions the clacks on the backhead are just elbows; the working clacks are located below the footplate; the frames are braced with fabricated stiffeners in a like manner to "Twin Sisters." Very few castings have been used, cutting from the solid or building-up being preferred whenever possible. The saddle-tank is made throughout from copper sheet. The chimney will, no doubt, satisfy the most critical judge! We look forward with anticipation to the completion of this engine.



Mr. L. R. Raper's unfinished $3\frac{1}{2}$-in. gauge model saddle-tank locomotive

The judges had more difficulty in deciding on the runners-up, owing to the diversity of the exhibits. They finally awarded three consolation prizes. One was to Mr. D. R. Ripley for his first serious attempt at model engineering, a 1-in. scale coal-fired traction engine to a Greenly design. This is a very creditable piece of work in a new direction, for it must be explained that Mr. Ripley has been the hon. secretary of the Bradford Model Yacht Club for many years, and is an expert on model yachts and racing them. He and his society have always supported the Leeds S.M.E.E.'s exhibitions, and on the last occasion in October, 1949, he must have picked

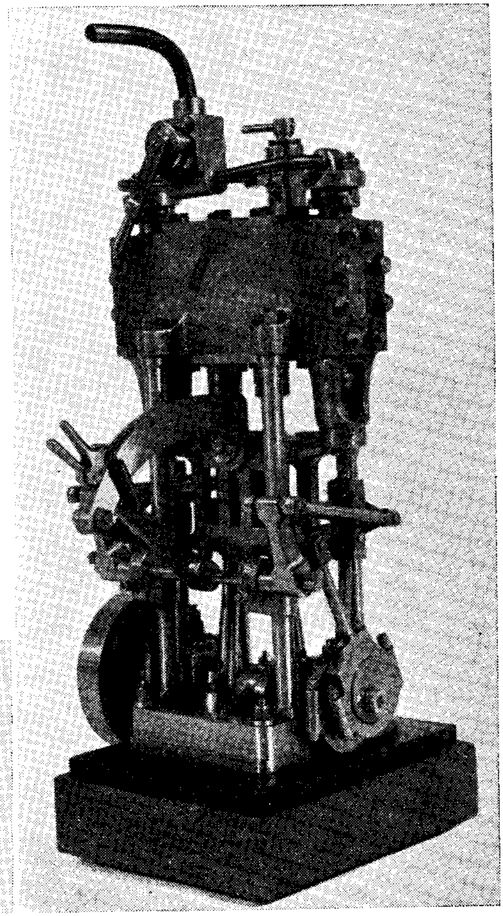
up a germ, because he has since produced this traction engine, and is now working on a locomotive !

Another consolation prize was awarded to Mr. S. Mitchell, who has only turned to serious model engineering since his retirement. His first model was a small steam engine made during his apprenticeship, then in 1935 he made a 2½-in. gauge locomotive. His exhibit on this occasion was a 2-cylinder vertical steam launch engine, to his own design, made in 1940. He delights in slow careful work with small hand tools, his equipment is very limited. This engine has a very silky motion and turns over on a breath of air.

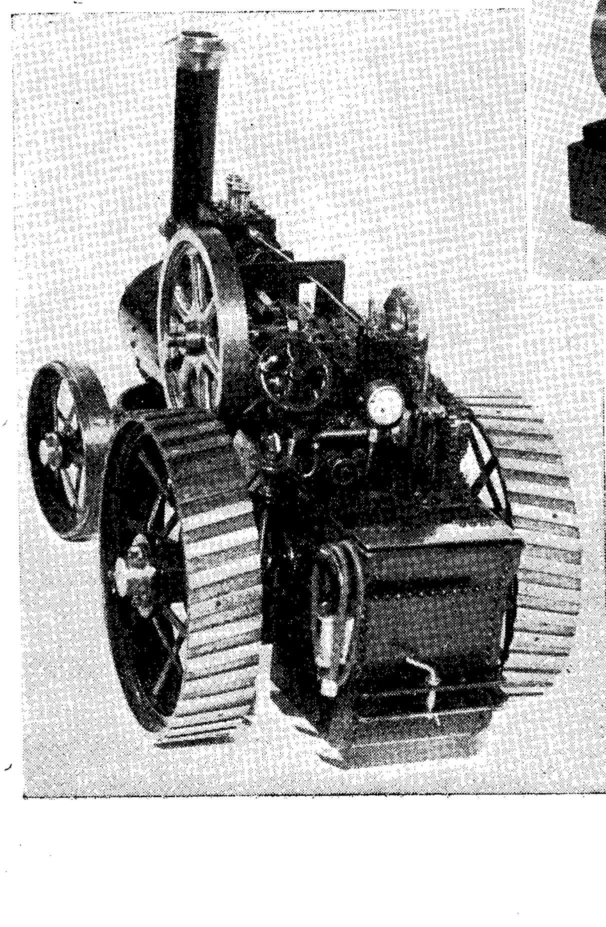
The other consolation prize went to the chairman of the Leeds society, Mr. J. Hainsworth for a substantially built vertical slide.

Mr. Hainsworth also displayed, but not in the competition, some parts for his 3½-in. gauge L.N.E.R. *Green Arrow*. Externally this will be a faithful replica to perpetuate the memory of Sir Nigel Gresley's fine class of locomotive. In addition to this, it is designed to do hard work on the passenger track, and some very sound construction is being employed. The 3-cylinder block, with piston valves, has been carved out of a block of nickel-cast-iron. The leading and trailing wheels are mounted with the correct type of suspension, as on the original.

A number of other notable exhibits were displayed, but lack of space prevents their being described in detail. A large gathering of members made this a very enjoyable evening, and much encouragement was given to the officers of the club to push ahead with preparations for the next full-scale exhibition to be held in Leeds towards the end of this year.



Mr. S. Mitchell's model twin-cylinder vertical steam launch engine



Mr. D. R. Ripley's model 1-in. scale coal-fired traction engine

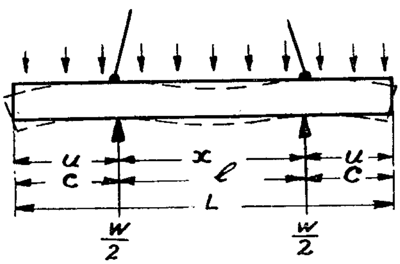
Model Car Supplement

Development and Stressing of Chassis

by G. W. Arthur-Brand

Mr. F. G. Buck working on his pan type chassis

THE model racing car has developed, from meagre beginnings, into nothing short of a miniature mechanical wonder. Since the earlier days of its *debut* back in 1942, a number of major developments have vastly affected its trend in general design, until today, with speeds well past the century mark and increasing annually, safety of machine and spectators can only be ensured by meticulous care and attention to precisely the same principles which govern the production of a full-sized Grand Prix car. In addition, however, to the stresses and strains which affect its grown-up brother, we must consider, also, the forces set up by rapid gyration on a circular course, restrained by a cable which attaches it to a centre pole or pivot.



$$L = l \tfrac{5}{16}\, 2c$$

Let us concentrate for a moment on the subject of centrifugal force in our endeavour to discover how it may be expected to affect the structure of a miniature racing car in action.

It should not be too difficult to grasp that the force we are about to discuss is brought about by the constraint which compels our model to move in a circle. Since the direction of the motion is there continually changing (being always tangential to the circle), it follows that a force must be continually acting to produce the change. This force is brought about by the constraint. For example, if a line attaches a body to a centre, the force is the pull the cord transmits to the body; it acts always towards the centre, and is a centripetal force. Its reaction is the pull applied by the body to the line and acts away from the centre, being the centrifugal force, the magnitude of which is directly proportioned to the mass of the body and the square of the linear speed, and inversely proportioned to the radius of the circle. This may be represented by the formula:—

$$F = \frac{Mv^2}{r} = Mw^2r$$

Where F is the centrifugal force, v is the velocity in ft./sec. w is the *angular* speed of rotation and M the mass or weight of the car.

Earlier miniature racing cars were constructed on much the same lines as their full-size brethren, but as speeds rose and engines became more powerful as the result of continuous development, it became necessary to improve streamlining by the addition of undershielding, and from this emerged the pan-type chassis used almost universally on all modern types. In addition to its cleaner lines and much decreased resistance at optimum speeds, it offers, too, far greater rigidity to the strains set up by the action of centrifugal force. It may not be as realistic, perhaps, as the old swept up side members and tie-bars of the earlier cars, but properly designed and fitted with the appendages of the modern Grand Prix racer, it is convincing enough to be admired by many of the hardened *connoisseurs* of the sport. We will not, however, skip the old method, and it will be my aim to prove that, with the help of a few none too difficult calculations, all of which will add to the interest of constructing a miniature racing car, a perfectly strong and efficient chassis can be developed along authentic lines which, with the addition of an undershield, would be lighter and offer no more resistance than the cast pan.

The accompanying figure represents one of the side chassis members supported by its two tethering points, the load being supplied by the distribution of component parts acted upon by centrifugal force.

Between each tethering point and the end adjacent :—

$$S = \frac{W}{2ZL}(c - u)^2$$

Between the tethering points :—

$$S = \frac{W}{2ZL}[c^2 - x(1 - x)]$$

Stress at each tethering point :—

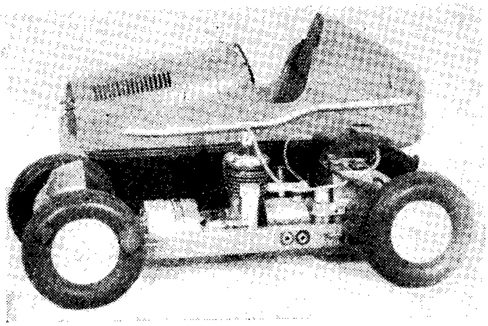
$$\frac{Wc^2}{2ZL}$$

Stress at centre :—

$$\frac{W}{2ZL}$$

The greater of these is maximum stress when the section is constant.

Should l be greater than $2c$, stress is zero at points $\sqrt{\frac{1}{4}l^2 - c^2}$ on each side of the centre.



A conventional chassis, somewhat weakened by drilling for the booster sockets

Should the cross-section be constant and $l = 2.828c$, stresses at the centre and at the tethering points are equal and opposite ; they are :—

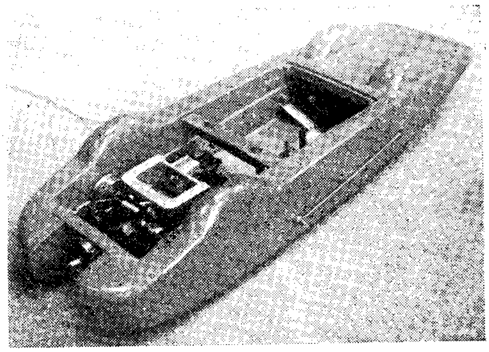
$$\pm\frac{WL}{46.62Z}$$

Between each tethering point and the adjacent end :—

$$y = \frac{Wv}{24EIL}[6c^2(l + u) - u^2(4c - u) - l^2]$$

Between tethering points :—

$$y = \frac{Wx(l-x)}{24EIL}[x(l-x) + l^2 - 6c^2]$$



A channel section chassis, faired to the shape of the prototype

Deflection at ends :—

$$\frac{Wc}{24EIL}[3c^2(c + 2l) - l^2]$$

Deflection at centre :—

$$\frac{Wl^2}{384EIL}(5l^2 - 24c^2)$$

When l is between $2c$ and $2.44lc$, maximum outward deflections occur at points $\sqrt{36\frac{1}{4}l^2 - c^2}$ on each side of the centre, which are

$$\frac{W}{96EIL}(6c^2 - l^2)^2$$

Where :—

S = bending at any point
Z = section modulus of beam cross-section
y = deflection at any point
W = load on beam
E = modulus of elasticity
I = moment of inertia.

WHAT'S NEW

FROM an almost deathly hush since the season ended comes word that several stalwarts are busy building for the 1951 fracas. Not everyone is concerned about this " out of season " lull, however, as witness the recent report regarding the winter activities of the Hastings model car section of their M.E. Society.

At the New Pavilion track recently, several members attended an enjoyable evening's racing. A new member making his miniature speed *debut* was Hastings's well-known motor-cyclist Mr. George Wheeler, who clocked 58.82 m.p.h. Mr. Seymour, with his E.D. powered " Wasp " clocked 52.14 n.p.h. and Mr. Smith's 5 c.c. model did a very nice " quarter " at 70 m.p.h.

Mr. J. Elliott's realistic scale model 5 c.c. B.R.M. showed that a model which actually does look like the real thing can compete on even terms with the best of the speed models by clocking 81.33 m.p.h. This made him joint 5 c.c. track record holder with Mr. H. F. Smith. In this class also, Mr. Marshall's twin-cam Austin did a very nice steady run at 69.23 m.p.h.

In the 10 c.c. class, Mr. Smith gave his new Maserati an airing in chassis form and put up a speed of 90 m.p.h. for its first run.

Racing takes place at the New Pavilion, Falaise Road, every Friday evening at 7.30, and the public is welcome.

RAPID SPEED CALCULATION

by R. H. Warring

THIS handy pocket-calculator is intended for quick determination of lap or race speeds of model cars running on a circular course. It is, in fact, a slide rule with scales proportioned and allocated to specialised requirements.

It would be perhaps as well to emphasise right at the beginning that such a calculator, unless precision-made and with machine-engraved scales, cannot be *perfectly* accurate. It is not, for example, intended to replace speed tables for the calculation of actual contest results. No slide rule can compete with accurate speed tables in this respect. Being a simple type of slide rule, too, it is subject to slight errors due to paper shrinkage in blockmaking and printing. As far as possible this is overcome by drawing and printing the appropriate scales as one. They are then separated *after* pasting in place.

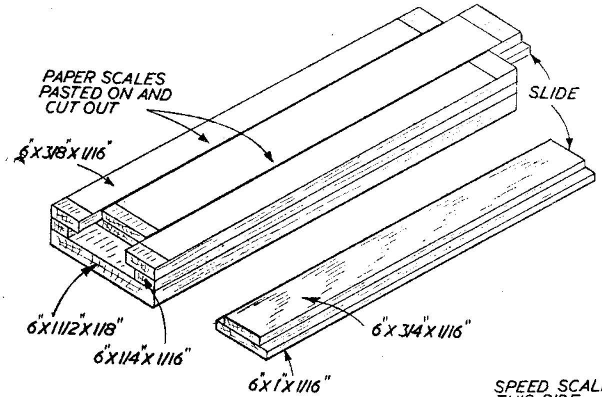


Fig. 1. Simple slide rule assembly

However, bearing in mind these limitations, the various applications of this simple pocket calculator are numerous. Speeds can be calculated in a second or so for any number of laps from one to ten. You can use it to get an instantaneous result for a rival model's speed, for example, or give an immediate public announcement of the speed of any run, subject to the official speed being announced later after reference to speed tables. As far as spectators are concerned, it is the *speed* in which they are most interested—not the elapsed time to complete the course. In this respect the calculator is likely to be far more accurate than individual timing with stopwatches.

The basic rule is laid out with four scales. Setting the number of laps against the radius of circle, the appropriate speed is read off on the top scale against the elapsed time for that number of laps. For instantaneous readings, therefore, preset the rule to number of laps against circle radius and immediately read off speed as soon as the time has been recorded. Nothing could be simpler and there are no possibilities of any appreciable error.

All racing models are divided into classes, according to motor capacity. In the model car world, the three classes are: motors 5-10 c.c.; motors 2.5 to 5 c.c.; and motors up to 2.5 c.c. Normally, competitions and records are confined to particular classes, but handicap events are always an added interest to any programme. Here the problem of devising a suitable handicap system sometimes influences the organisers to preclude an event which would have a popular following.

An accepted form of handicap is to grant the smaller class cars an additional percentage of their speed as a bonus. Typical figures are 70 per cent. of the actual speed recorded for the 0-2.5 c.c. class; and 30 per cent. of the actual speed added for the 2.5-5 c.c. class.

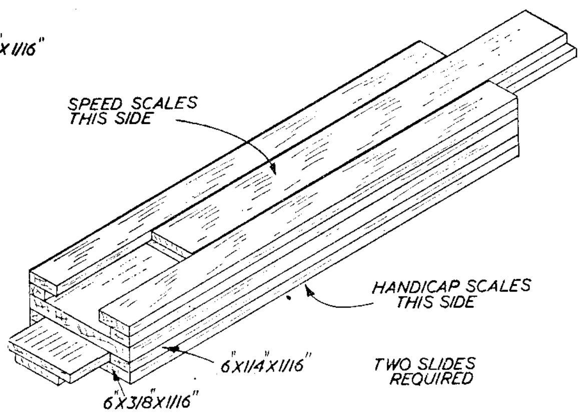


Fig. 2. Multiple slide rule assembly

With this in mind we have drawn up a second scale correcting actual or recorded speeds to any handicap figure. Set the handicap figure to be used against the recorded speed and read off the corrected speed against the arrow adjacent to the upper scale. Again simple, quick and accurate enough for a first result. Official figures would, of course, be worked out on elapsed time and reference to speed tables once more.

We have made the handicap scale universal,

to include both added and subtracted handicaps. The division is clearly marked on the scale. A subtracted handicap is very rarely used, since the performance of the two larger classes is reduced to a lower level to compare with the slowest class. This has an unflattering effect. A bonus handicap, on the other hand, gives a more favourable impression, particularly as far as the public is concerned.

Fig. 1 shows the construction of the rule itself to take either of the two scales mentioned. For the material we would suggest hard balsa which is very easy to cut and work accurately, and is readily bonded with balsa cement. The parts required for the body are a base 6 in. × $1\frac{1}{2}$ in × $\frac{1}{8}$ in.; with the sides built up from two pieces of 6 in. × $\frac{1}{4}$ in. × $\frac{1}{16}$ in. and two pieces of 6 in. × $\frac{3}{8}$ in. × $\frac{1}{16}$ in. These are cemented together as shown.

The slide is made from two pieces, each 6 in.

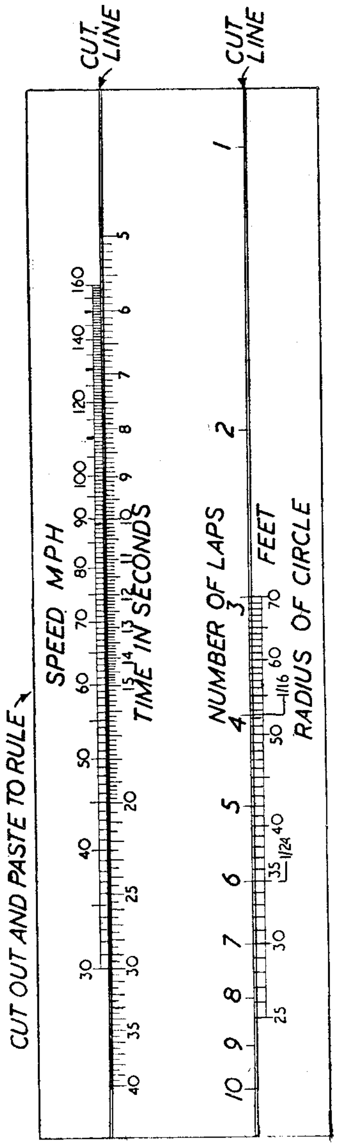


Fig. 3. Speed scales—full size—cut out as one

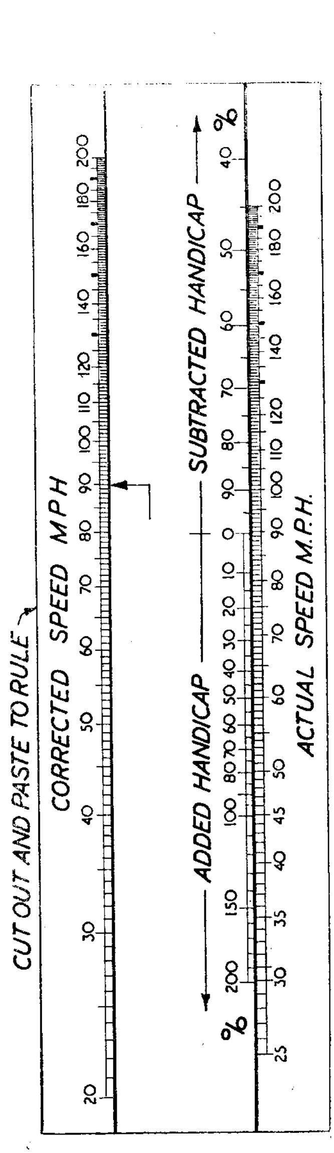


Fig. 4. Handicap scales—full size—cut out as one

SPEED TABLES—½ MILE

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
10.0	180.0	14.3	125.9	18.6	96.79
.1	178.2	.4	125.0	.7	96.27
.2	176.5	.5	124.1	.8	95.75
.3	174.8	.6	123.3	.9	95.24
.4	173.1	.7	122.4	19.0	94.79
.5	171.4	.8	121.7	.1	94.24
.6	169.7	.9	120.8	.2	93.73
.7	168.2	15.0	120.0	.3	93.24
.8	166.7	.1	119.2	.4	92.75
.9	165.1	.2	118.4	.5	92.22
11.0	163.7	.3	117.6	.6	91.78
.1	162.2	.4	116.9	.7	91.34
.2	160.7	.5	116.1	.8	90.91
.3	159.3	.6	115.4	.9	90.46
.4	157.9	.7	114.7	20.0	90.0
.5	156.5	.8	113.9	.1	89.56
.6	155.1	.9	113.2	.2	89.12
.7	153.8	16.0	112.5	.3	88.66
.8	152.6	.1	111.8	.4	88.25
.9	151.3	.2	111.1	.5	87.78
12.0	150.0	.3	110.4	.6	87.39
.1	148.8	.4	109.8	.7	86.96
.2	147.5	.5	109.1	.8	86.59
.3	146.3	.6	108.5	.9	86.12
.4	145.1	.7	107.9	21.0	85.71
.5	144.0	.8	107.2	.1	85.33
.6	142.9	.9	106.6	.2	84.87
.7	141.8	17.0	105.9	.3	84.5
.8	140.6	.1	105.2	.4	84.08
.9	139.5	.2	104.6	.5	83.7
13.0	138.5	.3	104.0	.6	83.33
.1	137.4	.4	103.4	.7	82.94
.2	136.3	.5	102.9	.8	82.56
.3	135.3	.6	102.3	.9	82.18
.4	134.3	.7	101.7	22.0	81.83
.5	133.3	.8	101.1	.1	81.44
.6	132.4	.9	100.6	.2	81.09
.7	131.4	18.0	100.0	.3	80.72
.8	130.4	.1	99.5	.4	80.36
.9	129.6	.2	98.91	.5	80.0
14.0	128.6	.3	98.4	.6	79.65
.1	127.7	.4	97.84	.7	79.3
.2	126.8	.5	97.32	.8	78.99

SPEED TABLES—½ MILE

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
22.9	78.59	27.2	66.19	31.5	57.14
23.0	78.24	.3	65.95	.6	56.96
.1	77.91	.4	65.70	.7	56.78
.2	77.57	.5	65.46	.8	56.60
.3	77.25	.6	65.22	.9	56.42
.4	76.92	.7	65.00	32.0	56.25
.5	76.60	.8	64.78	.1	56.07
.6	76.28	.9	64.53	.2	55.89
.7	75.96	28.0	64.29	.3	55.72
.8	75.64	.1	64.05	.4	55.56
.9	75.32	.2	63.82	.5	55.39
24.0	75.00	.3	63.59	.6	55.22
.1	74.71	.4	63.37	.7	55.05
.2	74.41	.5	63.16	.8	54.88
.3	74.09	.6	62.92	.9	54.71
.4	73.77	.7	62.71	33.0	54.54
.5	73.47	.8	62.50	.1	54.38
.6	73.17	.9	62.29	.2	54.22
.7	72.87	29.0	62.07	.3	54.05
.8	72.57	.1	61.86	.4	53.88
.9	72.29	.2	61.65	.5	53.73
25.0	72.00	.3	61.44	.6	53.57
.1	71.67	.4	61.23	.7	53.42
.2	71.43	.5	61.01	.8	53.26
.3	71.18	.6	60.82	.9	53.10
.4	70.92	.7	60.61	34.0	52.93
.5	70.60	.8	60.41	.1	52.78
.6	70.30	.9	60.20	.2	52.63
.7	70.03	30.0	60.00	.3	52.48
.8	69.77	.1	59.81	.4	52.33
.9	69.50	.2	59.61	.5	52.18
26.0	69.23	.3	59.40	.6	52.03
.1	68.97	.4	59.20	.7	51.87
.2	68.71	.5	59.01	.8	51.72
.3	68.44	.6	58.82	.9	51.58
.4	68.17	.7	58.63	35.0	51.43
.5	67.91	.8	58.45	.1	51.28
.6	67.66	.9	58.26	.2	51.13
.7	67.41	31.0	58.07	.3	50.99
.8	67.15	.1	57.88	.4	50.85
.9	66.91	.2	57.69	.5	50.71
27.0	66.67	.3	57.51	.6	50.56
.1	—	.4	57.33	.7	50.41

long cut from $\frac{1}{16}$ in. material, one to $\frac{3}{4}$ in. width and the other to 1 in. width. The smaller piece is cemented accurately over the centre of the wider piece.

The slide should now be a reasonably tight sliding fit in the body. It must not be sloppy, neither must it be so tight that it is difficult to move. Actually the best method is to assemble both body and slide together and then withdraw the slide whilst the cement is setting.

The required set of scales—either Fig. 3 or Fig. 4—is then cut out as one and cemented or pasted on top of the rule, lining up the cut lines accurately with the body-slide dividing line. Smooth down and allow to set. When dry, part along the cut line with a sharp razor blade to separate body and slide once more. The rule is then ready for use.

The scales may be protected by covering with cellulose tape or treated with paper varnish, if desired. Some form of protection is advisable, for the paper will suffer a certain amount of wear in time, especially if the rule is carried around in the pocket.

Fig. 2 shows how a double rule may be built up to accommodate both the speed and handicap scales on the same pocket instrument. This simply involves building up another slide carried on the other side of the base and making a second slide to fit. The scales are then pasted to both top and bottom of the finished, assembled rule and separated as before when dry. Properly made, such a rule will give excellent service. It does not take long to make and will cost only a few pence. It is very necessary, however, to use the printed scales as reproduced in Figs. 3 and 4. These are logarithmic scales and very difficult to copy or duplicate by measuring off without introducing inaccuracies.

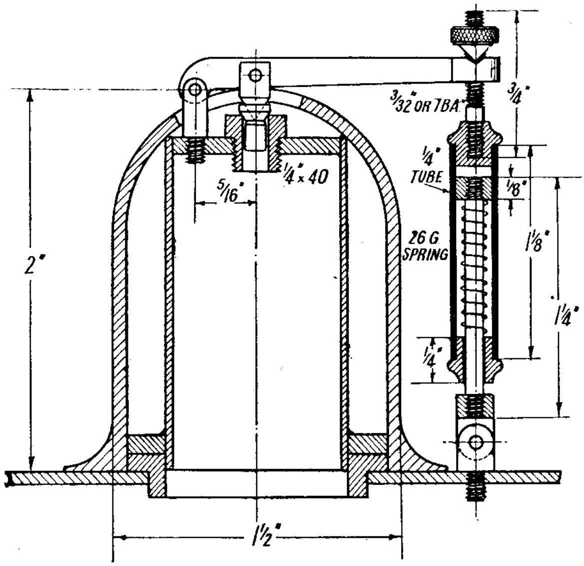
As we said at the beginning, too, this rule is not intended to *replace* speed tables for strictly accurate working, but merely to supplement them. Accordingly, therefore, we give a range of speed tables applicable to typical course distances.

These speed tables are calculated for a distance of ½-mile (and thus irrespective of cable length and number of laps). Races may be run over ¼-, ½-, 1-, 5- and 10-mile courses when the same tables can, of course, be used simply by reducing the recorded time to the equivalent of ½-mile distance. Time to complete a 1-mile course, for example, would be divided by two to give equivalent time for ½-mile, and so read the speed from the tables.

"L.B.S.C.'s" Beginners' Corner

Safety-Valves for "Tich"

OUR worthy friends who are building *Tich* will remember that I showed a spring-balance type of safety-valve on the smaller boiler, and and ordinary direct-acting spring-loaded valve on the larger one; but if anybody wants to change them over, it will be quite all right. However, builders of the smaller boiler will have to cut down the height of the inner dome, and use the regulator described for the larger boiler; whilst the larger boiler fraternity will have to increase the height of the inner dome, or use a long bush, to bring the height of the valve seating to the top of the dome casing. My honest advice is to leave them as they are. If any builder who is using the smaller boiler, doesn't care for the spring balance, he can put the direct-acting valve in place of the dummy whistle, and shift the latter to the cab roof. Many full-size engines carry whistles on the cab roof, at the front edge, close to the weatherboard.



Spring-balance safety-valve

The Spring-balance Type

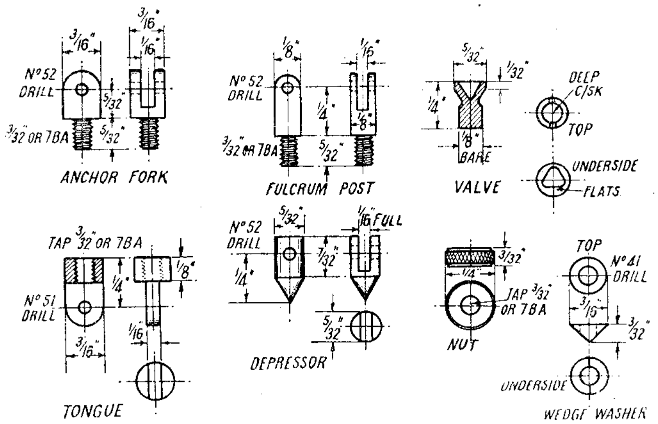
The spring-balance safety-valve is an interesting piece of apparatus. It is one of the oldest forms of locomotive safety-valve, and a direct descendant of the weighted lever, which was at one time practically universal for stationary boilers. It was obviously impossible to use a weighted lever on a locomotive, owing to the vibration when running; and the natural thing to do, was to substitute a spring for the weight. The great defect in the earlier types of spring-balance valves, was too much leverage; the distance between fulcrum and valve, and valve and spring, was far too great, and the valve could only lift the weeniest amount. To overcome the leverage, a large valve and a weak spring were necessary; and the valve, once it opened, remained open until the pressure had dropped a fair amount below the normal working pressure. This "dribbling" annoyed the old-time engine-drivers so much, that they got up to all sorts of antics to prevent it, most of which considerably increased the working pressure; and as there were no high-pressure boilers in those days, there were a few boiler casualities, more or less serious. It was these circumstances which led to the introduction of the "lock-up" valve, which consisted of a direct spring-loaded valve, in a casing which usually resembled a cross between a Victorian mantelshelf ornament, and a tea urn; and it was so arranged that the drivers could not interfere with it.

It was Stroudley who discarded the long-leverage valve, and substituted the short one with success. When he came from the Highland Railway to Brighton, he tried a type of valve known as Adams patent safety-valves, on the boiler barrels of his first tender engines. They proved unreliable, and would allow pressure to rise above the working limit, when they suddenly blew off like a modern pop safety-valve; but unlike the latter, they had a trick of sticking open. He therefore designed a spring-balance valve with short leverage, which was so successful that his successor, R. J. Billinton, continued to fit the same type until the middle of 1901. I remember when one of the "nobody's darlings" (radial tanks) appeared with no balances, but a pair of Ashton pop safety-valves over the firebox. The next one had a pair of Brighton-made direct-acting spring valves in brass columns, also over the firebox; and that type became standard from then onwards. However, the old spring-balances already in existence gave excellent service for a good many years after that; and it is this type which I am specifying for *Tich*.

The Action of the Valve

The rawest of tyros will understand the action, from the illustration of the complete assembly. The wing valve, which is countersunk, is held down by a "depressor" pinned to the lever. The latter is pivoted to a fork screwed into the

dome, and the outer end is held down by a variation of the well-known Salter weighing balance. In the present case, this is a long thin cylinder made of tube, with covers, piston, and rod complete; and a spiral spring is wound around the piston rod, pressing against the piston and the bottom cover. The top cover has a rod screwed into it, and this passes through an eye in the end of the lever; the pull on the lever can be adjusted by means of a knurled nut bearing on a wedge-shaped washer. The piston-rod sses through the bottom cover, and terminates in a tongue which is pinned to a fork screwed into the boiler. Pressure accumulating under the valve, tries to force the lever upward; but the pressure of the spring on the bottom cover, holds the lever down *via* the tube cylinder and the upper spindle. When there is enough force at the end of the lever, to overcome the spring, the lever lifts, and the steam escapes from the valve. The short amount of leverage, a little over



Safety-valve details

$3\frac{1}{2}$-to-1, allows a spring of sufficient flexibility to ensure a quick release of excess pressure, and a quick shut-down as soon as the pressure falls; it also admits of a smaller valve, with greater lift, than was possible with the old long-leverage valves.

How to Make the Parts

When describing the dome tops, I mentioned that the holes in the cast one, or a solid top for a tube one, were drilled No. 34, reamed $\frac{1}{8}$ in. and slightly countersunk with a centre drill. The separate seating shown in the complete assembly, is drilled and reamed likewise; it is made exactly like a cylinder gland, from $\frac{5}{16}$-in. hexagon rod, so needs no repetition. The valve is made from a piece of 5/32 in. round bronze rod held in three-jaw. First, turn down $\frac{1}{8}$ in. length to an easy sliding fit in the $\frac{1}{8}$-in. hole mentioned above; then turn the coned part to match the valve seat. The cone on the valve, and the coned seating, must, of course, be turned to the same angle, and the illustration shows how easily you can set a tool to do this, by chucking the centre-drill in the three-jaw, and adjusting the tool so that its edge touches the cone on the centre-drill. If you have a four-way tool holder—which should be a standard fitting on all home-workshop lathes—set the chamfering tool in it, to the centre-drill, before starting the valve; then you only have to swing the toolholder around to the correct station for forming the cone, after turning the shank with a knife tool. If your tool-holder is of the one-at-a-time variety, set a tool as shown in the detail sketch, and use it both to turn the shank and form the coned part. The tool must be set in sufficiently to form a little undercut, as shown in the illustrations, otherwise the valve will always be leaky. When turning the valve, use a spot of cutting oil, it helps a lot to get a nice surface on hard bronze. Tip: if the tool chatters when forming the cone—as it will, if the lathe is at all flimsy—pull the belt by hand, and feed very gently until the chattermarks disappear.

Next, with a file having a safe edge (one edge with no teeth cut on it) file a flat on the shank, opposite each jaw of the chuck. Don't file enough away, so that the end looks like a triangle with three sharp points; leave a little bit of "round" between each flat. Then part off at $\frac{1}{4}$ in. from the end, reverse in chuck, gripping by the shank, and—*very* important this—letting the chuck jaws bear on the bits of "round" between the flats; otherwise the valve won't run truly. Centre lightly, and then form the countersink with and arrow-head drill. The exact angle doesn't matter; and if you haven't an arrow-head drill, you can make one in a few minutes. Turn the end of a bit of 5/32-in. round silver-steel to a cone point, about 60-deg. angle; file it flat on both sides, back off the edges, and harden and temper, same as I described for D-bits. This is also useful for centring, where the little hole formed by an ordinary centring-drill, is not required.

Hold the shank in the bench vice, using two bits of sheet copper or brass, as clams to stop the vice-jaws from marking the shank. With a fine hacksaw, or a jeweller's saw, cut a nick across the countersink, but don't go deep enough to cut into the coned part. This is to take a screwdriver for grinding-in purposes, and the valve can be ground in right away. Beginners who own cars and do their own decarbonising and valve grinding, won't find this quite as arduous! A weeny taste of pumice powder and water, or a scraping off your oilstone, on the valve seating, will do the trick. It only needs a very few twiddles with a screwdriver, to get a perfect seating; but be mighty careful to wash away all traces of the abrasive with a spot of paraffin.

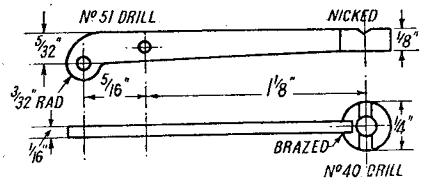
Lever and Accessories

The lever is filed up from a $1\frac{1}{2}$-in. length of $\frac{1}{4}$-in. × $\frac{1}{16}$-in. flat steel. Rustless steel could be used here with advantage, as the lever gets plenty

wet, through steam blowing past it. My boilers have a reputation for blowing-off ; thank goodness it isn't for blowing up ! Nickel bronze (German silver) could also be used, but ordinary mild-steel will do, if nothing better is available. The eye is separate, and brazed on. Chuck a bit of $\frac{1}{4}$-in. round rod in three-jaw, same material as lever ; face, centre, drill No. 40 for about $\frac{3}{16}$ in. depth, and part off a $\frac{1}{8}$-in. slice. File, mill or plane a $\frac{1}{16}$-in. nick in the edge ; press the end of the lever in it, and braze or silver-solder the joint, as described for other similar jobs. After cleaning up the lever, file a nick across the top of the eye, as shown, for the edge of the wedge washer to rest in. The angle needs to be fairly wide, so use a small square file. Drill the fulcrum pin-hole only.

Drilling and Slotting

The fulcrum post is turned out of a bit of $\frac{1}{8}$-in. square steel ; and in making it, beginners can put their acquired knowledge to use, as the drilling, slotting, etc., are the same as described for valve-gear forks. After parting off, reverse in chuck, turn down 5/32 in. of the end, to 3/32 in. diameter, and screw 3/32 in. or 7 B.A. An alternative fulcrum post for a cast inner dome, or a built-up one with rounded top, is also shown, and is self-explanatory.



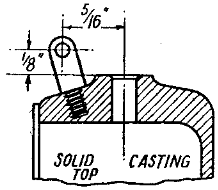
Safety-valve lever

The little slotted and pointed gadget which holds down the valve, is made from a bit of 5/32-in. round steel, rustless if possible. Cross-drill and slot the end, same as the fulcrum post ; part off to full length, reverse in chuck, and turn a cone point on the end, to a slightly sharper taper than the countersink in the valve. Note that from centre of pinhole to the point, is $\frac{1}{4}$ in. Did I bless these finicky little jobs when making the twin valves for *Grosvenor* ! ! Yet some good folk delight in them.

Pin the tail of the lever, in the slot in the fulcrum post, with a bit of $\frac{1}{16}$-in. wire. At $\frac{5}{16}$ in. ahead of the centre of valve hole in the dome, drill a No. 48 hole and tap it to suit the screw on the post. Screw in the post, with a taste of plumbers' jointing on the threads, and be careful to avoid bending the lever. When the post is screwed right home, the lever should lie right across the centre of the valve. Hold the depressing gadget vertically, with the point in the countersink in the valve, and drop the lever into the slot. Set it so that the top is horizontal, then put the No. 52 drill in the hole in the depressor, and make a countersink on the lever. Drill th No. 51, and pin the gadget to the lever. This joint should not be too free ; but the fulcrum joint should be quite easy. When pinning these little joints I cut a bit of wire about twice the length required and ease one end with a fine file, with the wire in three-jaw, and lathe running fast. This is easily pushed through the drive-fit holes in the forks ; it is then squeezed home with a pair of pliers, until tight in the forks, and the surplus cut off. Don't forget a spot of oil.

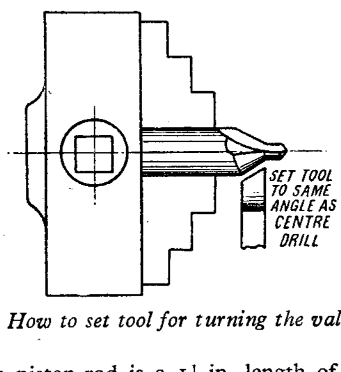
Spring-balance

The casing of the spring-balance may either be a piece of $\frac{1}{4}$-in. thin brass tube, squared off



Alternative fulcrum post for dome with curved top

to $1\frac{1}{8}$ in. length, or a piece of $\frac{1}{4}$-in. brass rod of same length, drilled right through with 13/64-in. drill. Both ends are turned from $\frac{5}{16}$-in. brass rod. Chuck in three-jaw, face, centre, and drill down about $\frac{5}{16}$ in. with No. 41 drill. Turn $\frac{1}{8}$ in. of the outside to a press-fit in the case. To do this, take a weeny scrape out of the end of the tube with a taper broach, then turn the rod so that it will just start entering, if the sharp edge is taken off. The rest will then require a good squeeze to get it home, which is as it should be. Part off at $\frac{1}{4}$ in. from the end, reverse in chuck, and turn the outside to the shape shown, or as near as you can get it. For the upper plug or cover, repeat the turning part, but don't drill. Part off at $\frac{1}{4}$ in. from the end, as before, then reverse in chuck and turn the outside ; after which, centre, drill No. 48 for $\frac{3}{16}$ in. depth, and tap 3/32 in. or 7 B.A. This end can be pressed into the case, and a $\frac{3}{4}$-in. length of 3/32-in. rod, threaded as shown, screwed into it.

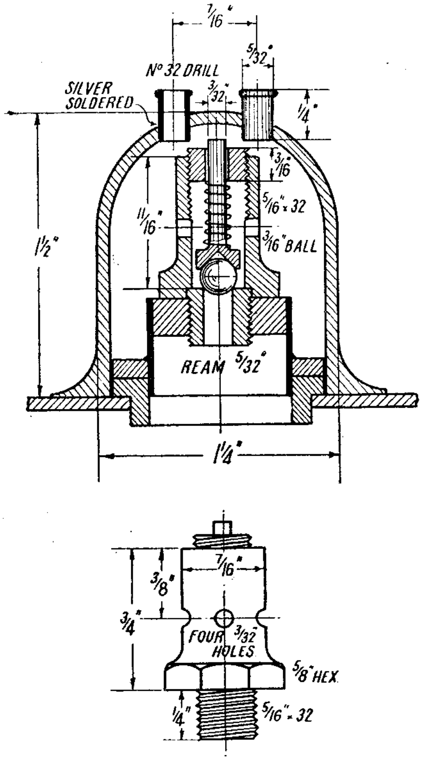


How to set tool for turning the valve

The piston-rod is a $1\frac{1}{4}$-in. length of 3/32-in. rod with $\frac{1}{8}$ in. of thread on each end. Screw a $\frac{1}{8}$-in. slice of $\frac{1}{4}$-in. rod on one end, chuck in three-jaw, and turn down to an easy sliding fit in the case. Wind up a spring from 26-gauge tinned steel, or hard brass or bronze wire, around a 3/32-in. mandrel ; slip it over the piston-rod, place in the case, and press in the bottom cover.

The spring should just start to compress as the cover enters. Chuck a piece of $\frac{3}{16}$-in. rod, face the end, centre, drill down $\frac{1}{8}$ in. with No. 48 drill, and tap to match the screwed end of piston-rod. Part off at 11/32 in. from the end; screw this on to the end of the piston-rod, file flat each side to form a $\frac{1}{16}$-in. tongue, round off, and drill No. 51. The anchor fork, into which the tongue fits, is made in the same way as the fulcrum post, only $\frac{3}{16}$-in. square rod is used instead of $\frac{1}{8}$-in.

For the nut, chuck the $\frac{1}{4}$-in. rod again; face, centre, and drill No. 48 for about 5/32 in. depth.



Direct-acting safety-valve
(The portion under the ball is NOT a separate part as drawn)

At 3/32 in. from the end, run a parting tool about 1/32 in. in, forming a groove. Between the groove and the end, knurl the rod by holding a flat second-cut file hard down on it, whilst pulling the lathe belt back and forth by hand. I find this method gives a better knurl than the regulation little wheel in a holder. Part off, and tap the nut 3/32 in. or 7 B.A. to match the spindle on top of the case. The wedge washer is merely an ordinary washer 3/32 in. thick, filed away at each side, to form a very blunt wedge, as shown in the illustration.

How to Assemble

At $1\frac{1}{8}$ in. from the centre of the dome, on top centre-line of the boiler, drill a No. 48 hole, tap 3/32 in. or 7 B.A. to suit the anchor fork, and screw same in, with the slot parallel to centre-line of boiler. It may be sweated also, like a stayhead. Put the spindle on top of the balance casing through the hole in the eye of the lever, and put on the wedge washer and nut, the ridge of the washer sitting in the nick in the eye. Put the tongue of the piston-rod in the slot in the anchor fork, secure it with a pin, and you're through. If desired, one side of the hole through the anchor fork can be tapped $\frac{1}{16}$ in. or 10 B.A., the other drilled No. 51, and a screw used, instead of a pin, for securing the tongue to the fork. Adjustment of blowing-off pressure is made by screwing the knurled nut up or down the spindle, as required.

Direct-acting Safety-valve

This is a simple job, with no finicky parts attached to it. The body of the valve is made either from a casting, or from $\frac{5}{8}$-in. hexagon bronze or gunmetal rod. For the latter, chuck the rod in three-jaw, and turn down $\frac{1}{4}$ in. of the end to $\frac{5}{16}$ in. diameter; screw $\frac{5}{16}$ in. $\times$ 32. Face the end truly, and part off at $\frac{3}{4}$ in. from the shoulder. Reverse, and rechuck in a tapped bush held in three-jaw. If a casting is used, chuck by the larger end, and machine the screwed end same way. Then for either kind, centre the end, drill right through with No. 24 drill, open out to about $\frac{1}{2}$ in. depth with 9/32-in. drill, and bottom to $\frac{11}{16}$ in. depth with a D-bit same size. Tap $\frac{5}{16}$ in. $\times$ 32 for about $\frac{5}{16}$ in. down, and put a 5/32-in. parallel reamer through the remains of the little hole at the bottom. Turn down the outside to $\frac{7}{16}$ in. diameter, just far enough to leave about 5/32 in. of hexagon next to the screw, so that a spanner can be used for tightening up when screwing the valve into the squat dome. At $\frac{3}{8}$ in. from the top, drill four 3/32 in. or No. 40 holes through the sides, to let the steam out into the dome casing, from whence it will escape through the tubes at the top.

For the nipple, chuck a piece of $\frac{5}{16}$-in. round rod in three-jaw; face the end, centre, and drill No. 40 for $\frac{1}{4}$ in. depth. Screw $\frac{1}{4}$ in. of the outside $\frac{5}{16}$ in. $\times$ 32, and part off a $\frac{3}{16}$-in. slice. Make a hacksaw cut across one end, like the slot in a cheese-head screw, so that a notched screwdriver may be used to turn the nipple when setting the valve to blow off at correct pressure. To make the plunger, chuck a bit of $\frac{1}{4}$-in. round rod in three-jaw, and turn $\frac{9}{16}$ in. length to 3/32 in. diameter; take two or three fine cuts at high speed, when finishing to size. Part off at $\frac{11}{16}$ in. from the end. Reverse in chuck, take a skim off the boss, to bring it to 7/32 in. diameter, then centre it, and countersink it as shown. If you have any centre-drills with the tips broken off, they do very well for jobs like this; otherwise, an arrow-head drill can be made, as described for the spring-balance valve, with a rather more obtuse angle than an ordinary drill. However, an ordinary $\frac{3}{16}$-in. drill will do the trick, if a proper countersink isn't available, but don't go too deep.

To assemble the valve, simply seat a $\frac{3}{16}$-in. rustless steel ball on the hole, same as when making the pump valves, put a 22-gauge spring (wound up from tinned steel wire around a 3/32-in. mandrel) on the spindle, and place on the

ball as shown; then screw in the nipple. The ends of the spring should be touched on a fast-running emery-wheel, to square off the ends, otherwise the valve will have a tendency to dribble; if the spring doesn't press the cup down "fair and square," the ball doesn't seat properly.

Dome Covers

Both larger and smaller dome covers can be machined same way. All I do, is to hold the bodies in three-jaw, flange outwards, and bore just like boring a cylinder, until they are a tight push fit on the dome bush. The bore extends the full length of the parallel part. A bit of hard wood is then turned to a tight fit in the bore, driven in, chucked in three-jaw, and the casting set to run truly. The big dome can be centre-drilled at the top, when running truly, with a centre-drill in the tailstock chuck, and the tailstock centre used to support the casting whilst turning the outside. I rough-turn mine with a round-nose tool in the slide-rest, and finish off the round part with a hand graver, as illustrated for finishing the smokebox door. The bottom part of the flange, which cannot be turned, is finished off with a half-round file, and emery-clothed, whilst the job is still in the chuck.

If there is any roughness on the curved base which sits on the boiler, clean it off with a half-round file. To finish the saddling, get something which is round, and of the same diameter as the boiler; wood, metal, or even a bottle would do, if truly circular. Lay a piece of emery-cloth over it, and rub the base of the dome on same, pressing well down; this will soon form a curved seating, true enough to suit our requirements. I have described several ways of machining these seatings, by milling, flycutting, and so on, any of which would form a seating that would earn the approval of Inspector Meticulous; but they are not essential for the job in hand.

Drill a $\frac{3}{8}$-in. hole in the top of the larger dome; then, with a round file, slot this out sufficiently to clear the fulcrum post. To put the dome in place, take the knurled nut and washer off the spring-balance spindle, and turn the lever up vertically; the dome can easily be slipped over the lot, and the lever replaced in its correct position.

Dummy Valves

The smaller dome needs adorning with a couple of dummy Drummond-type safety-valves, which aren't exactly 100 per cent. dummy, as they actually let the surplus steam out. Drill two 5/32-in. holes in the dome casing, at $\frac{7}{16}$ in. centres as shown. Note—these holes are not at right angles to the surface of the dome, but vertical; beginners may find it easier to drill 9/64 in. or No. 24 holes straight in, and then hand-ream them with a 5/32-in. reamer, holding same vertical when turning it with a tap wrench. The two little columns are turned from $\frac{5}{16}$-in. rod; after the experience you have now had in turning, this should be just a kiddy's practice job needing no detailing. Make them a tight squeeze fit in the holes in the dome, and they will "stay put" without further fixing. If at all slack, silver-solder them. Alternatively, the holes in the dome could be tapped 5/32 in. $\times$ 40 (using No. 30 drill) and the lower part of the pillars threaded to suit, and screwed in. Next stage, backhead fittings.

The Model Power Boat Association

At the annual general meeting held recently in London, several matters of interest to members were discussed.

The balance sheet showed a slightly less amount of cash in hand but our financial position is still very good. Copies of the balance sheet may be had on application by club secretaries.

Competition Rule 11. The bridle or other line will now be 48 in. from centre of boat to point of line attachment instead of 24 in.

Festival of Britain. It is not known yet whether the M.P.B.A. will be demonstrating on the small pond on the South Bank site.

Regattas

The M.P.B.A. International Regatta this year will be a two-day event. Saturday, June 16th—straight-running boats only and the following day the usual international programme.

Fixture List to Date

May	6th	Northern Association
"	6th	South Eastern Association
May	12th (Sat.)	Welling (no speed events)
"	14th (Whit Monday)	Bournville
"	27th	Victoria
June	3rd	Enfield
"	9th (Sat.)	Coventry
"	16th (Sat.)	International
"	17th	"
"	24th	Blackheath
July	1st	Orpington
"	1st	Derby
"	8th	Wicksteed
"	15th	St. Albans and North London
"	22nd	South London
Aug.	12th	West London
Sept.	2nd	Grand Regatta
"	16th	Kingsmere

The South London club are running two Festival of Britain regattas in conjunction with the local council. Dates: May 20th, September 23rd.

Geneva Regatta—August 11th-12th.

Paris Regatta—September 9th.

Hon. Secretary: J. H. BENSON, 25, St. Johns Road, Sidcup, Kent. Tel.: Foots Cray 7428.

A "Growler"

For Testing Small Armatures

by "Armature Winder"

ONE or two recent queries in THE MODEL ENGINEER have prompted me to write this article on testing small armatures. On first sight a small armature looks a terribly complicated mass of small wires, which the average model engineer decides to leave well alone; but is always left wondering: "Is the winding all right?"

The only piece of apparatus required to answer this question is a "growler" (Fig. 1). No elaborate meters or volt-drop testing equipment is necessary. The illustrations show how a "growler" can be made up, almost out of the scrap box.

But first, let me deal with the method of testing small armatures. There are three faults which can develop on an armature.

(1) *Earth Fault.* Now anyone who knows what a "Megger" is can very soon verify or eliminate No. 1.

(2) *Open Circuit.* That means a broken wire or faulty joint. This is a visual test. If the windings have had a knock, a broken wire can be seen on the surface; but if the break is internal it shows up on the commutator. Burning between two comm. bars or solder and wires thrown out of the comm. bars definitely indicate open circuit.

(3) *Short Circuit.* This cannot be seen, but means that two wires in the armature are touching one another, due to breakdown of the insulation. This fault can be located by the "growler."

From the illustrations it can be seen that the "growler" is simply a pair of tongs with laminated iron jaws, which are opened or closed, depending on the size of armature to be tested.

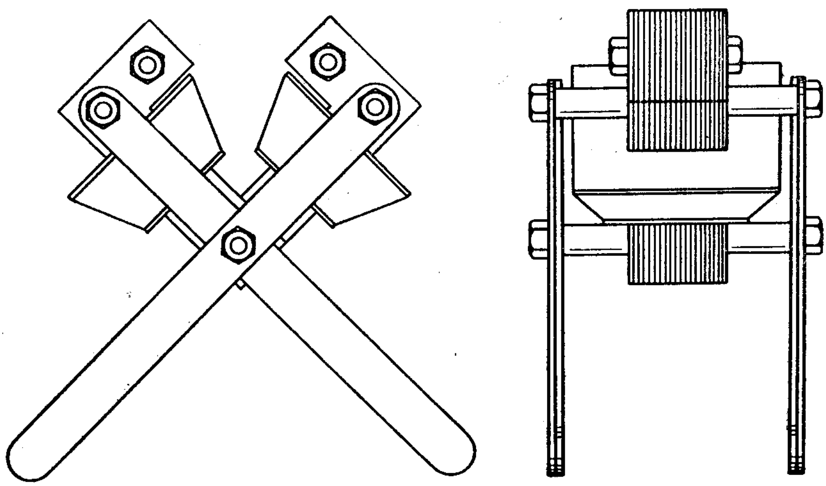


Fig. 1

On these jaws are wound two coils, which when energised with a.c. from the mains produce two alternating poles, changing at the rate of 6,000 times a minute.

By applying the normal mains supply of 50 c.p.s. to the coils, the effect in the armature is the same as in an armature revolving at 1,500 r.p.m. in the 4-pole field of a d.c. machine. Therefore, by testing an armature on a "growler," it is being tested under the same conditions as those which apply when the motor is running.

The only difference is, that the current in the armature on the "growler" is induced current on the same principle as a transformer, whereas in the motor the supply is from the brushes. It is the induced current in the armature which shows up the fault. When the current is applied to the coils, with an armature in position on the jaws, the windings of the armature become the secondary of a transformer. Therefore, if any turns in the armature coils are shorted, i.e. touching one another, an excessive current will flow in those turns. This current cannot be

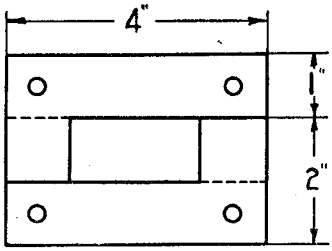


Fig. 2

Making Up

The main part is quite easy to build, the material required being ; a burnt-out transformer core with L-shaped laminations, a length of $\frac{3}{4} \times \frac{1}{8}$ in. strip steel for the legs, a short piece of $\frac{1}{2}$-in. rod for the spacers, a bit of $\frac{1}{4}$ in. rod and a few nuts. The transformer core that I used to build my " growler " was a burnt-out one which had been discarded from a low-volt lighting unit as used on machine tools in factories, to comply with Home Office regulations. (Fig. 2).

The laminations are first divided into two stacks, then the long limb on one stack is shortened as shown in (Fig. 3). The laminations are then re-arranged into two stacks, alternating one long, one short. (Fig. 3). When these are interlaced they form the hinge. An extra hole is required in the short limb, so that the laminations can be clamped tight. If you cannot get hold of an old transformer of the type specified, the laminations can be cut from the large type of E stampings as used on mains transformers.

The legs, spacers, etc. (Fig. 4) do not need any explanation.

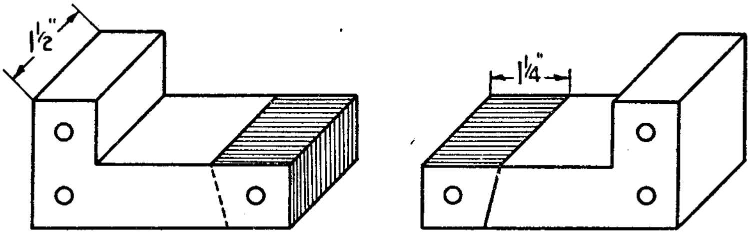


Fig. 3

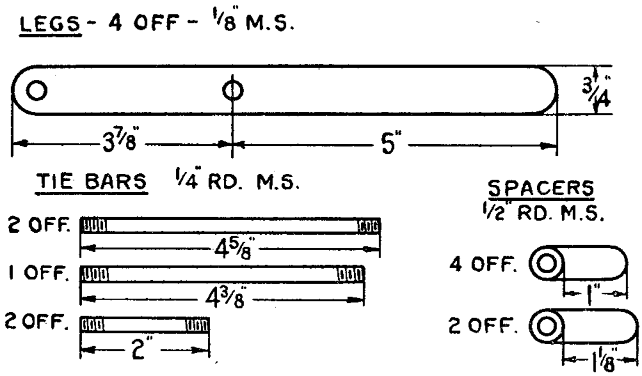


Fig. 4

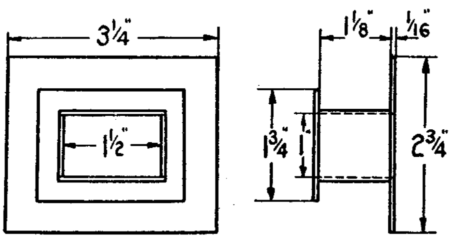


Fig. 5

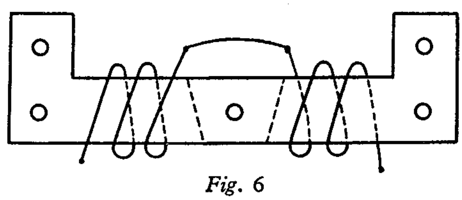


Fig. 6

seen or measured, but, if a thin strip of iron or steel (a piece of broken hacksaw blade) is placed over the armature slot which contains shorted turns, it will rattle like the " Clappers of He . . ."

Try each slot all the way round the armature, keeping the slot being tested on top. Switch off the current while moving the armature round, and keep your fingers off the comm., because it is " alive." Also, dirt, grease and bits of carbon dust off the brushes, which gets between the comm. bars will cause a slight rattle, so clean the comm. micas before testing.

The Coils

The next job is to make up the coil formers, using $\frac{1}{16}$ in. red fibre. (Fig. 5). These are wound with 800 turns each, of 28 s.w.g. double cotton covered copper wire, and connected as shown in (Fig. 6).

Do not leave the " growler " switched on without an armature across the jaws, because the iron circuit is not complete. I would like to add, that after 25 years as an armature winder, mostly big stuff (thank goodness), I *shudder* at the sight of a little 'un.

Novices' Corner

Notes on Hard Soldering

IT is not unusual to find that workers who have not had much experience avoid hard-soldering or brazing, as they regard it as a difficult operation calling for special skill to get a satisfactory result. Others, as a result of faulty technique, may have failed to make a firm joint and are then faced with the unwelcome prospect of thoroughly cleaning the work and making a second attempt. Provided a methodical way of working is adopted and certain simple rules are obeyed, there is really no difficulty in making sure of a good result. Making components by a process of fabrication or hard-soldering the parts together may save the time and expense involved in obtaining a casting; or, again, the worker may be spared the labour of cutting the particular component out of a solid piece of metal. The strength of a hard-soldered joint will be found ample for most purposes, and usually it is only when the part is highly stressed and of limited dimensions that machining from the solid becomes necessary; for example, the crankshaft of a small high-efficiency petrol engine requires maximum strength to withstand the severe loading imposed, whereas the counterpart in a relatively slow-running steam engine may be amply strong for its purpose if built up.

Brazing and hard-soldering on the grand scale, as applied to locomotive boilers, have often been ably described in these pages by contributors of wide practical experience. In the small workshop, however, components built up in this way will generally be of moderate size, such as those forming part of models or machine components.

Those making a start at hard-soldering should learn first how to use one form of solder and flux effectively, rather than employ a variety of materials for different jobs. By so doing, the correct temperature at which to work, and the best way of applying the solder and flux, will be more quickly learnt and confidence established. Some hard solders, although effective for joining non-ferrous metals, are unsuitable for use with steel.

However, *Easy-flo* silver-solder, manufactured by Messrs. Johnson, Matthey & Co., is recommended for making joints in brass, bronze, copper, nickel alloys such as German silver, and all types of steel, including stainless steel. Fortunately, this all-round solder is very easy to use, and it has many advantages over other kinds for most ordinary work. In the first place, Easy-flo has a lower melting point than common brazing spelter, as it becomes fluid at a dull-red heat; this means that when soldering brass parts, there should be no danger of melting the work itself if ordinary care is taken. Again, when jointing steel, the less the work is heated, the less risk there is of distorting the parts, and the material will suffer less from scaling and pitting. The strength of a joint made with this solder is usually greater than most non-ferrous metals themselves, and is not markedly inferior to mild-steel. A special flux, named Tenacity Flux No. 3, is supplied for use with this solder; it has the advantage that, unlike borax compounds, it can readily be removed from the work after brazing. This flux is supplied in air-tight tins, but, as it readily absorbs water from the air, once the tin has been opened the contents are, perhaps, better transferred to a well-corked glass bottle. As Easy-flo melts at a comparatively low temperature, joints can be made in wire and in other small articles by heating, even in the flame of a spirit lamp, but for larger work an air-coal gas burner will be required. The ordinary gas blowpipe will serve well for general work, although a self-blowing form of gas blowpipe will be sufficient for work of small or moderate size. The self-blowing burner, illustrated in Fig. 1, was made many years ago, and it is so efficient for small brazing that the larger, pressure-blown pipe is seldom needed.

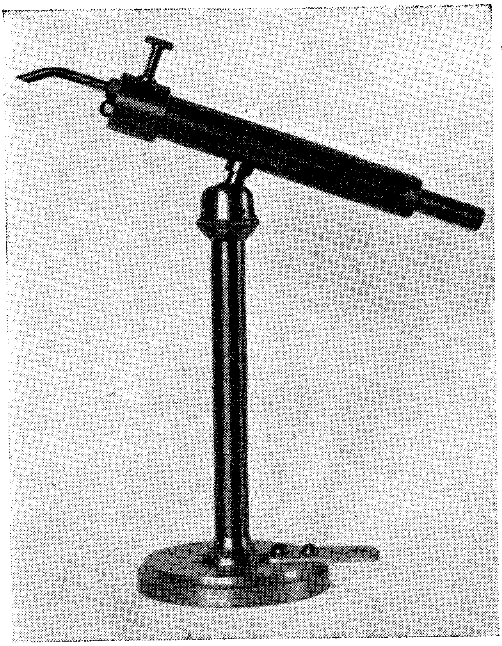


Fig. 1. A self-blowing gas burner for small work

This small burner throws an intensely hot, pale-blue flame some 8 in. in length when the gas supply is at normal pressure; in addition, the stand with its universally-jointed head is a great help in allowing the flame to be directed exactly where required.

A screw-down control valve is fitted to enable the size of the flame to be regulated to suit the

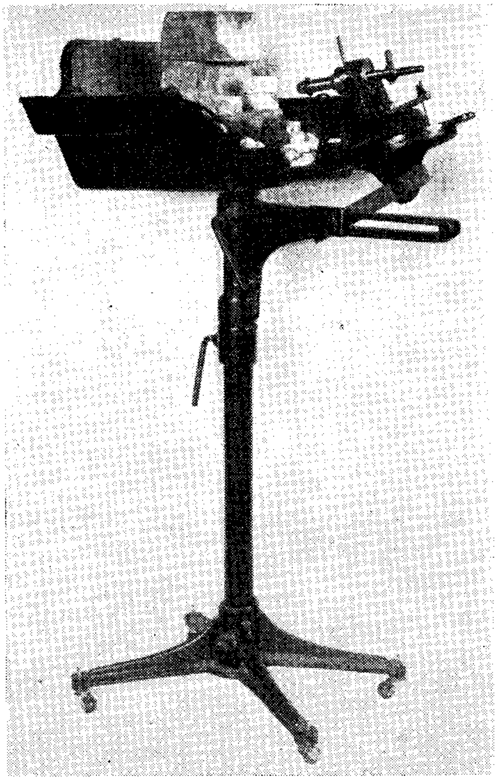


Fig. 2. A brazing hearth fitted with a gas blowpipe

work; also, the gas nipple can easily be changed to allow for any marked alteration in the pressure of the gas supply.

The Soldering Operation

When it comes to making a joint using Easy-flo, the first requirement is a brazing hearth of some kind, that is to say for all but the smallest work. This hearth can quite well be made with a baking pan, as represented in Fig. 3, or a large biscuit tin or a five-gallon oil drum can be cut to a convenient shape. Fireclay fire-backs will serve well for making the lining of the floor and back of the hearth so as to protect the walls from the direct heat of the flame. A flat firebrick will afford a level surface on which to stand the work, and asbestos cubes or pieces of fireclay or broken firebrick are built up round the work in order to direct the flame on to the brazing site and to prevent scattering of the heat. It is essential that the parts to be soldered should be properly prepared, for on this will largely depend the success of the operation. The joint surfaces should not be handled after they have been filed to fit or, if the work has been machined, all trace of cutting oil or grease should be removed with lighter fluid, or with a degreasing agent such as carbon tetrachloride. The joint surfaces should fit closely, and before the parts are finally assembled they should be covered with a film of the special flux made into a thick paste with water. Although the joint as fitted may be quite firm, when the heat is applied and expansion of the metal takes place the parts may alter their position. For this reason, the work should be well supported on the flat firebrick by packing with the asbestos cubes or pieces of firebrick. Sometimes a firm binding with iron wire is used to keep the parts in position, but remember that this wire will probably be the first part to become heated and so may expand and loosen. Before the heat is applied, the joint and the surrounding surfaces must be well covered with the flux paste, for too little flux will leave the joint unprotected and oxidization and scaling will then occur, which is, perhaps, the most common cause of failure. The solder can be obtained in the form of a powder, and when this is used it can be mixed with the flux paste and applied to the unheated work. More commonly, however, Easy-flo strip or wire is employed and these are applied in the following manner: While the work is being heated, the flux on the joint is carefully watched, and it will be seen first to bubble and then to form a red-hot molten mass; at the latter stage, and not before, the brazing rod is dipped in the flux and then touched on the joint. If the correct temperature has been reached, the solder will at once melt and run into the joint quite freely; the heat is then turned off and the work allowed to cool.

It is, of course, essential that the solder should

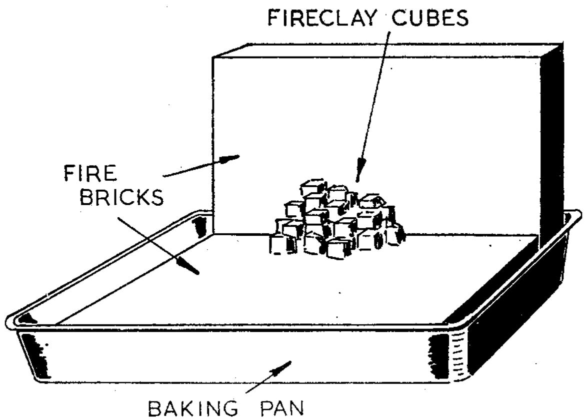


Fig. 3. An easily made small brazing hearth

run right into the joint, as a mere fillet of metal on the outside will have but little strength. After the work has cooled somewhat, it is plunged into water to get rid of the flux. The flux is soluble in hot water and can usually be removed quite easily with a stiff brush, but a wire brush will do the job more quickly. After cleaning, examine the work carefully to make sure that the solder

(*Continued on next page*)

A KALEIDOSCOPE

by F. S. Weston

KALEIDOSCOPE ! The very name suggests to the mind a child's toy—a gaudy tin or cardboard cylinder, with spy hole at one end and loose fragments of coloured glass sliding about between two pieces of glass at the other. As it is shaken, the pieces of coloured glass move and form a different pattern—to the child's delight.

Yet a kaleidoscope is far more than that, and properly made becomes a most interesting and instructive instrument and very entertaining.

The usual kaleidoscope has two mirrors set at an angle of about 60 deg. with one another, and the resultant pattern gives a threefold design.

If it is so made that any small object, or objects, can be inserted, it at once becomes more interesting. The number of mirrors can also be increased, thus giving a more complicated figure.

In the small kaleidoscope shown, in the sketch, three mirrors are used and this arrangement gives a four-square diagram or figure. The mirrors should be as thin as possible, so that the design is not spoiled by the blank spaces formed by the edges of the glass.

A case of the shape shown was made from ¼ in. thick mahogany with the exception of the hinged lid which was ⅛ in. thick. The small end is of vulcanite drilled centrally with a ¼-in. hole, countersunk. The other end slopes as shown and forms the object table. The thin lid is hinged, and an aperture formed at the larger end to admit light, either daylight or artificial. The two long sides are recessed, as shown, to house a small piece of plain glass cut to shape. This glass is not fixed, but is held in position when the lid is closed. This arrangement allows any small objects to be put on the table, which should have a covering of black velvet or black velure paper.

The three fixed sides are lined with thin leather and thin mirrors cut to shape, fixed to the leather backing with adhesive. A handle is fitted to the outside, and a small spring clip provided to keep the lid closed.

Quite wonderful and beautiful results are obtained by using, for example, two small pieces of jade-coloured plastic (cut from an old tooth-brush handle) one piece in the form of a crescent and the other circular, two or three imitation pearl beads and two small pieces of bright ⅛ in. diameter brass rod. These simple items will give hundreds of different designs suitable for brooches, clasps, pendants, etc. Small pieces of cellophane red, blue, green or yellow, crumpled up will give the effect of ruby, sapphire, emerald or topaz. The choice and variations of objects are endless.

Another form of kaleidoscope was arranged with a metal circular base lantern about 8 in. in diameter by 3 in. deep. A 25-W lamp was fixed in this container and covered by a disc of opalite glass.

This arrangement illuminated the objects from below, and with transparent objects was most interesting. A revolving glass table was arranged between the lantern and the mirrors and cut-out masks of different designs cut in thin black paper. One mask laid on the lamp glass, remained stationary, and a second mask above it made to revolve. Endless designs were thus obtained, and by the introduction of colour screens the effects were still further varied. The hood covering in the mirrors was fitted with a reflector containing a small tubular lamp so that, if desired, by operating a switch, the light below was cut out and ordinary top lighting obtained or a combination of both.

Yet another and larger form of kaleidoscope was made in which the mirrors, two in number, were hinged so that they could be opened out to 180 deg. or brought into face to face contact. As the angle between the mirrors becomes small the number of images is increased although only two mirrors are used.

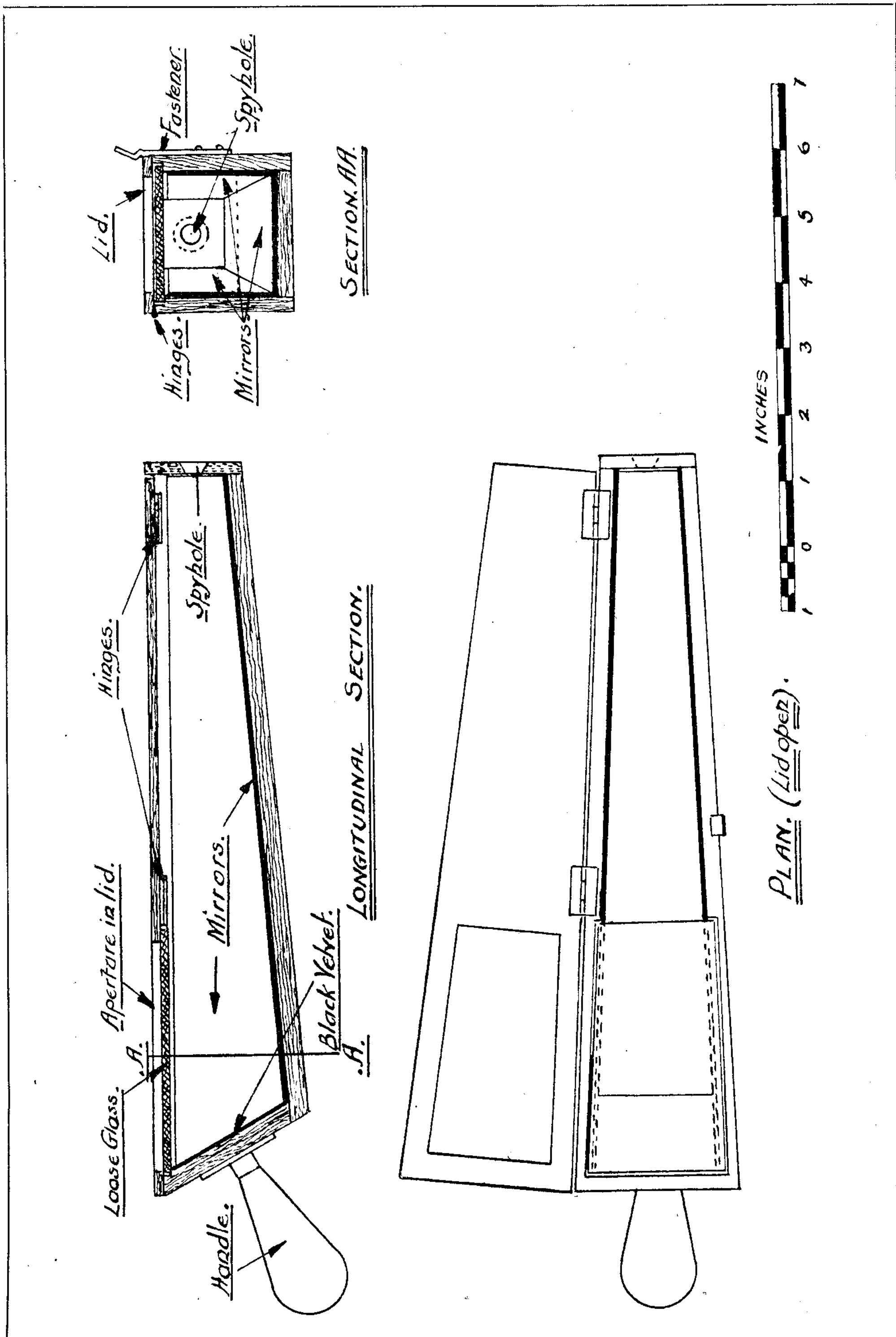
Again the mirrors may be made slightly convex or concave, this gives distortion and consequent complication in the resultant figure.

Such simple and interesting instruments give a great deal of pleasure, not only in the making, but afterwards are found to be entertaining to others and the selection of objects and their variation gives hundreds upon hundreds of different designs, all interesting and many most beautiful.

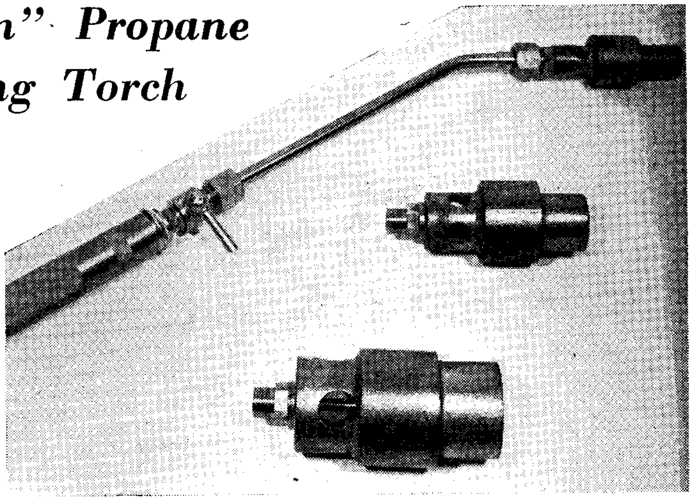
Novices' Corner

(*Continued from previous page*

has run properly into the joint ; if necessary, file the joint surfaces to enable the solder to be detected more easily on the opposite side of the joint. Both brass and steel are readily jointed in this manner, but, when soldering steel parts, do not use greater heat than is necessary or the special flux used may cause surface pitting of the metal. It is unnecessary as well as inadvisable to exceed a dull-red heat, for overheating may impair the strength of the solder and, in any case, will not make it flow more readily. Finally, to ensure success : make certain that the work is clean ; use plenty of flux ; and do not apply the brazing strip until the flux has become quite molten.


Lid.
Fastener.
Spyhole.
Hinges.
Mirrors.
SECTION. AA.
Loose Glass.
A.
Aperture in lid.
Hinges.
Spyhole.
Mirrors.
Black Velvet.
A.
LONGITUDINAL SECTION.
Handle.
PLAN. (Lid open).
INCHES
1
0
1
2
3
4
5
6
7

The "Ferguson" Propane Gas Heating Torch



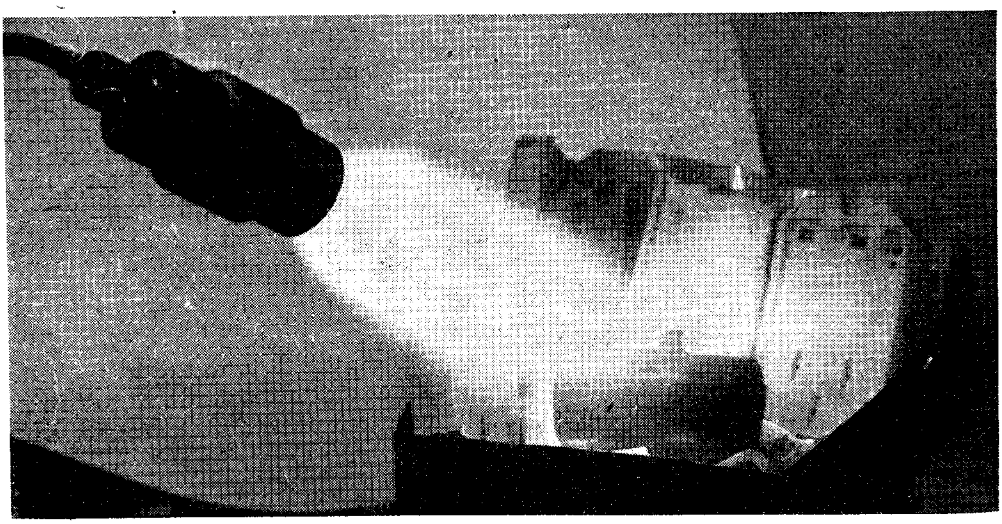
WE have recently had the opportunity of trying out a new type of burner, working on the self-blowing "Bunsen" principle. Though it is referred to as a Propane gas heating torch, other gases in this class are just as suitable. The gas supplied for the test was Pyrogas. The kit comprises a handle, and an extension tube which terminates in a union to receive the selected burner, of which there are three sizes. These are illustrated in the first photograph. For comparison of size, the small burner is $\frac{7}{8}$ in. diameter at the mouth × $3\frac{1}{4}$ in. long, medium burner $1\frac{3}{8}$ in. diameter × $3\frac{1}{2}$ in., and large burner $1\frac{7}{8}$ in. diameter × 4 in. Each burner requires a different gas pressure, which necessitates the use of the type of pressure regulator and gauges normally used with high-pressure acetylene bottles.

Requirements and performance figures stated by the makers are given below :—

Burner	Length of Flame	Gas Consumption	Required Working Pressure
	in.	lb. per hr.	lb. per sq. in.
Small ..	10	$1\frac{1}{2}$	6
Medium	14	3	10
Large ..	18	6	15

Each burner was tested in the "M.E." workshop, using the makers' recommended pressure. The performance in each case was very good, there being a marked difference in the "power," of each burner, which simplified the selection of the correct burner for the job. The medium burner gave a performance perhaps slightly inferior to that of an 8-pint blowlamp, but the large burner really did warm things up, including the air temperature in the workshop—accompanied by the appropriate roar. An ON-OFF cock fitted in the handle enables the operator to adjust the flame to requirements. It was found that on "full bore" the makers' statement regarding lengths of flame was not excessive. The second photograph shows the medium size burner in use.

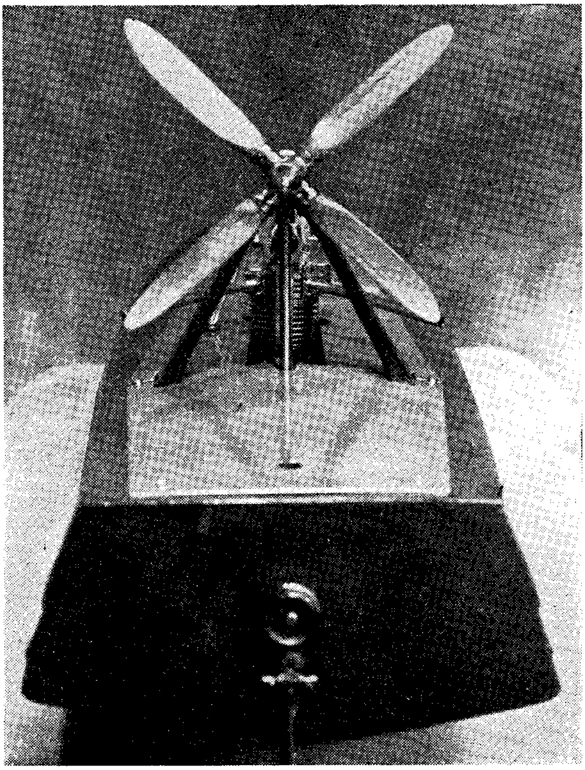
Further details may be obtained from the makers, British Cutting Gases Ltd., Mill Lane, Lymington, Hants.



An Air-Screw-Driven Model Launch

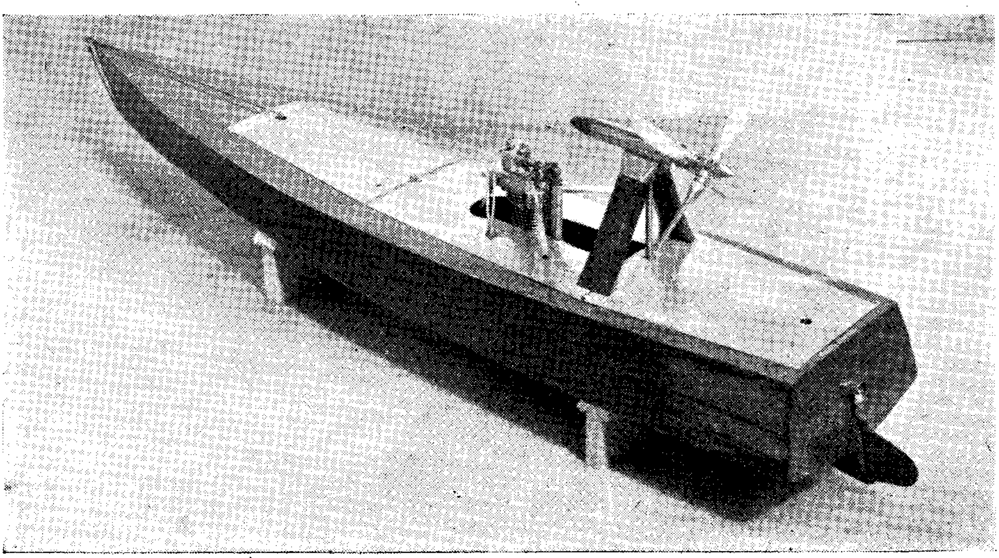
by D. H. Dray

THE photographs reproduced herewith illustrate a model launch which I have built and equipped with a somewhat unusual method of propulsion, which may be of interest to readers. The power unit is a 10 c.c. four-stroke overhead camshaft engine, which was described in my article in the issue of THE MODEL ENGINEER dated March 30th, 1949. It is installed in a more or less normal position in the hull, and drives contra-rotating two-bladed airscrews through the medium of bevel gearing and a vertical shaft, which rotates at one-half engine speed. At the top end of the shaft is a small bevel gear which engages with two larger gears fitted in the propeller nacelle, thereby driving the horizontal propeller shafts coaxially, but in opposite directions. This method of propulsion entirely eliminates torque reaction and keeps the boat perfectly stable at all speeds. A flexible coupling is fitted between the engine and the lower bevel gear shaft, and this is extended through the stern of the boat and fitted with a starting dog, enabling the engine to be started by means of a hand brace.



The hull of the launch is 4 ft. long

(*Continued on next page*)



Boiler-Making Simplified

by F. Watson

ONE often reads " that the boiler was put out as I had not the means to make it," or words to that effect.

I am at present making a boiler for my 5-in. " Minx " engine. On account of my health, it is being made the easy way. It would be quite impossible for me to make it by the excepted methods due to the bodily strain, so perhaps these few hints to the elderly and for those people who dislike being roasted by a 5-pint blowlamp will be useful.

Those who have an acetylene torch and know how to use it will not need my advice. I have a torch but no cylinders at present, but when these are available I hope to get a young friend to do the job, while I supervise.

Briefly, the idea is to make the outer and inner firebox first, with the holes for the tubes drilled to 1/64 in. undersize. The holes for the superheater tubes should also be bored undersize, and all the tubes fitted so that they do not fall through. Before the barrel is fitted on, the holes for the stays should be drilled, the barrel may then be fitted on with a " piston ring." All joints, including the backhead and foundation ring should be silver-soldered.

The tubes and superheater flues should be put in last and fixed with the lower melting Easy Flow. The barrel can now be placed into position and secured with copper screws through the piston ring. The tube-plates could then be placed over the ends of the tubes and secured with Easy Flow. While the whole is being heated, the barrel can be fixed to the firebox end with Easy Flow, to complete the job.

By the proposed method the boiler could be put together without bodily strain; also, the difficult handling of a *heavy boiler* can be avoided during the long process of drilling all the stay holes. If made by this method, too, there is less to heat up during the many operations. Note that too long exposure to blowlamp heat *can* bring on a nasty cold.

To repeat, the man with a torch will not need this advice, if he can use it on copper.

All my boilers have been put together with silver-solder and Easy Flow. Such material is expensive, but I do not like substitutes.

Another point is that the girder stays can be made to fit properly by the proposed method and one can tell if they do so.

The writer has built quite a number of small locomotive boilers, but has never *bent* a wrapper round the end plates.

My method is very simple. The plates should first be thoroughly softened, and to do this the following items are needed. A " blower," consisting of a piece of tinplate about 20 in. × 24 in. and some cinders. When the fire burns clearly, put on some cinders and place the " blower " against the fire, leaving a small space at the bottom.

In a short time you will have a lovely fire—and without setting the chimney on fire!

Place the piece of sheet copper on the fire and allow it to show a dull red; turn if necessary to soften it evenly all over, making sure that there are no hard places. But *don't burn* the copper plate. Liven up the fire with the blower if necessary.

After softening the copper plate, place it upright between two pieces of wood, say, one or two in. thick, and bend with a mallet the shape of the letter " U," getting both ends as even in length as possible.

Obtain two steel bars from a scrap-yard, about 1 ft. long 1½ in. wide and ¾ in. thick. Drill two clearing holes ⅜ in. in diameter about 1 in. from each end of the bar. Place the two bars together and drill through the other, to form two clamping bars, with long ⅜ in. bolts and nuts.

Tighten up the nuts, and in a few minutes the wrapper will be nicely formed round the end plates. If this is carefully done, a wooden former is not necessary.

As a precaution against crushing in the end plates, some pieces of wood can be fitted into them, about 1 in. thick, if desired, but I do not find them necessary.

The other day I made mine sitting down quietly at my rough wooden table, without any strain—a quiet job for an elderly man. A little help, etc., is sometimes useful.

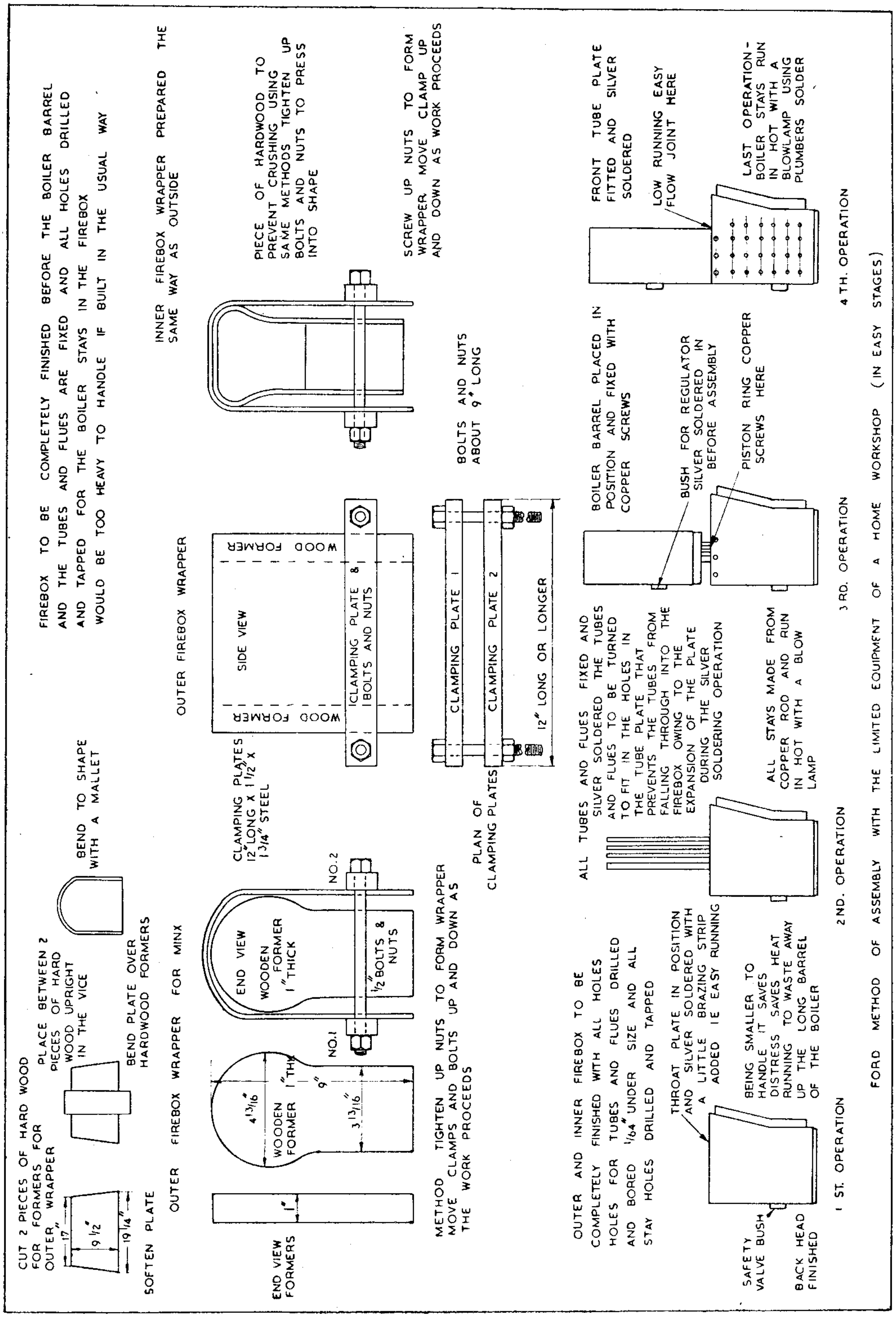
The boiler has been made and tested, and the engine has had about five hours' steam test under a stationary boiler; the engine and tender are now completely finished—less handrails—" L.B.S.C.", I thank you.

An Air-Screw-Driven Model Launch

(Continued from previous page)

× 10 in. beam, and is ribbed and planked longitudinally with $\frac{1}{16}$-in. deal planks. The deck is of 3/64-in. plywood, with an aluminium hatch cover. The engine is fitted with coil ignition, and a micro cut-out switch is fitted in the hull and operated by a push-rod from the bows, so that the ignition is cut off if the launch hits the bank. Another similar cut-out is fitted at the stern, and a string can be attached to operate this cut-out when the boat reaches the limit of run required, so that the launch can be stopped and retrieved.

The speed of the boat is approximately 10 m.p.h., but the steering is rather erratic in high winds, due to the amount of top hamper.



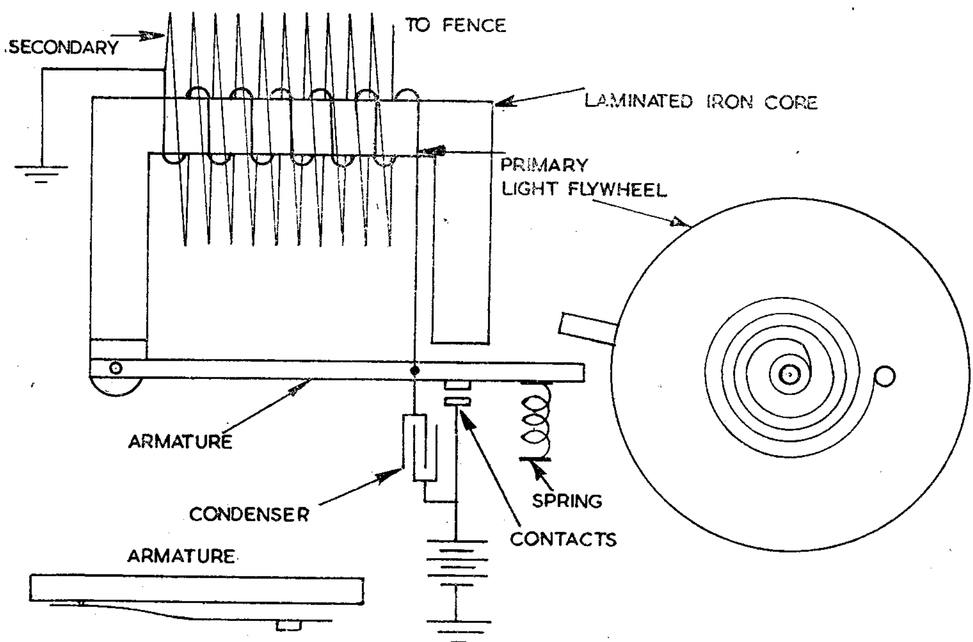
FORD METHOD OF ASSEMBLY WITH THE LIMITED EQUIPMENT OF A HOME WORKSHOP (IN EASY STAGES)

PRACTICAL LETTERS

Electrified Fences

DEAR SIR,—The rough diagram herewith may help to answer the query No. 9863 *re* " Electrified Fences." I think it should be self-explanatory but in case it isn't, the following remarks may explain its action.

Normally the contacts are kept open by the compression spring beneath the tip of the armature. When, however, pressure is applied by the projection on the flywheel, due to the action of the oversize hairspring, the contacts close. This closes the primary circuit, causing the armature to be pulled sharply upwards and throwing the flywheel backwards for the best part of a revolution. At the same time the contacts open breaking the primary circuit and inducing a high-tension voltage across the secondary winding. The flywheel swings round again and the cycle is repeated regularly until the battery is switched off.



On looking over the diagram again I find that it would have been better to have shown the armature insulated from the core. The armature contact would also be better fixed on a spring blade (see small sketch) similar to an electric bell armature.

The action of the marble in Mr. Sutherland's arrangement is probably similar to that of the flywheel in this device.

Yours faithfully,

Aberdeen. A. B. SCORGIE.

Tiller Steering

DEAR SIR,—May I be permitted once more to reply to Mr. J. A. Smith on the above subject? It is becoming a bit tedious, I know, but as a matter of historical accuracy I must protest again that tiller steering is not as common as he would have us believe.

Perhaps a brief " re-cap." of the statements made would help to clarify the situation. My original one was that tiller steering on steam rollers was " somewhat unusual "—not, be it noted, " very unusual." Then (7-9-50) Mr. Smith says " This is not so "—(and if a thing is *not un*usual, surely it must be usual : in other words, *in common usage*, according to the dictionary). In the same letter, Mr. Smith went on to say that tiller steering was adopted by other makers, and included a very nice photograph of a Wallis & Stevens Advance roller to prove it.

Replying on October 5th, I said " I am aware, of course, that tiller steering was adopted by other makers, but that does not make it a ' usual ' feature on steam rollers in general . . . the vast majority of steam rollers had the *usual* (conventional) type of traction engine steering, by chassis . . . I maintain again that tiller steering is *not* ' usual ' for steam rollers."

Now (4-1-51) Mr. Smith says " I did not by any means say it was a usual type of steering " ; but if his statement quoted in paragraph two does not mean that, then what does it mean?

He then proceeds to drag in a red herring in the shape of a "number" of McLaren traction engines (although steam rollers is the subject under discussion); and because he can quote only four makers who fitted tiller or similar steering to a *comparatively few engines only* of their vast output, he triumphantly concludes that I am trying to lead people astray!

Well, if we are to include traction engines as well as steam rollers, let us do so by all means. I can find him several others—offhand, Burrell, Clayton & Shuttleworth, and Tuxford—who fitted tiller or similar steering to a few of their machines, but the proportion will then fall even more sharply! For facts are facts, and Mr. Smith cannot truthfully deny that of the literally hundreds of firms who built traction engines in many parts of the world, only a few ever fitted tiller steering, and even then only to a comparatively small proportion of their total output.

Which, I submit, makes my original contention that tiller steering was "somewhat unusual" almost an understatement!

Yours faithfully,
Sheffield. W. J. HUGHES.

Aluminium Brazing

DEAR SIR,—With reference to your very good article on the above subject, I must make two suggestions.

(1) *Never* dip the rod in a tin of flux; it sets up action which seems to go through the whole tin. Place a small quantity of flux in an egg-cup, use this and wash the egg-cup. Do not return flux to the tin, and do not have the tin open to the air longer than necessary.

(2) Warn people *not* to try and braze light alloys with more than 2 per cent. magnesium—I've tried it.

Yours faithfully,
New Mills. K. R. WHISTON.

Old Toys, etc.

DEAR SIR,—Referring to your Editorial in THE MODEL ENGINEER, No. 2589, I was the proud possessor of one of the model fire engines described by Mr. Mortley. I well remember the cork safety-valve and other features. The firm of Theobald had an establishment in Farringdon Road and issued a very thrilling catalogue of models, all most enthrallingly described in somewhat grandiloquent phrases. I was eight years old at the time—1894—and my greatest pleasure was to get my mother to read these aloud to me in an alluring voice.

About two years later, I saved up enough money at school to buy the parts to make "a truly magnificent horizontal steam engine with slide-valve cylinder, eccentric, bedplate . . ." and so forth. I waited in a turmoil of excitement for the arrival of the goods. Imagine my disappointment when from rather a dirty brown paper parcel tumbled out what appeared to me to be useless lumps of metal. These were, of course, the usual castings. I had expected fully finished parts suitable for assembly with the aid of a penknife. I returned these dull impedimenta and with the aid of additional—borrowed—cash obtained the cheapest oscillating engine supplied by this intriguing firm. I well remember that my treasured copy of their catalogue was, to my utter horror, thrown on the fire by my housemaster who discovered me reading it in class when I should have been construing Virgil Aeneid 4!

I may say that the boiler of the engine I purchased had a real water-gauge, but the pressure-gauge was a dummy with a printed scale and pointer. The latter fitting filled me with disgust!

I must have been one of the earliest subscribers to THE MODEL ENGINEER. I recall that it was such a success that the Editor—our beloved "P.M."—invited his readers to fill in a form to say if they would like it issued monthly, fortnightly or weekly. I voted for the latter. An Editorial later stated that some readers had indicated a preference for a daily issue!

Perhaps I was also one of your youngest contributors for, at the age of nine, a letter of mine, with illustration, was published on how to make a cheap Morse key. You may be sure I was very proud of this.

I still retain my zest for model engineering after a lifetime of the full-scale profession. In the last four years I have built a twin-cylinder Stuart Turner engine, a Kennion mill engine, a 5-c.c. diesel engine, a marine boiler and a small oscillating engine and boiler. I am just completing a stern-wheel boat built on the lines of the one described in THE MODEL ENGINEER book on power boats.

Yours faithfully,
London, N.5. CLIFFORD G. RATTRAY.

A Sturdy Veteran

DEAR SIR,—With reference to the letters in THE MODEL ENGINEER for January 11th *re* the old Drummond $3\frac{1}{2}$-in. lathe shown in the issue for December 7th, 1950. I, too, have one of these machines; actually, mine is the later version which was fitted with a compound slide.

This machine was a "hack" machine in the assembly shop at my works, where it worked well for over 20 years. I acquired it about three years ago for the proverbial song and you may be interested to know that Myford's made me a new spindle and fitted new bearings to the headstock; furthermore, the present-day type "M" Myford-Drummond change wheels are identical and interchangeable, so I was able to replace the missing wheels. I also obtained new studs for the change wheels and a new leadscrew nut, although this latter item required slight modification.

As the leadscrew is 8 t.p.i., the change wheels are made in steps of five teeth and I now have 20 (3 off to obtain a fine self-act) 25, 30, 35, 40, 45, 50, 55, 60 and 65. I also have an extra 30 and a 38 wheel. These wheels will cut all the usual threads, and any of the present type "M" change wheels can be used to supplement this list.

I have refitted the cross-slide and set the head and tailstock to cut exactly parallel, and at this setting the lathe faces very slightly hollow (about 3 thou. on 4 in. diameter). I wonder how many modern lathes will give such good service in 30-40 years time?

Yours faithfully,
Tunbridge Wells. BASIL R. S. CHALMERS.